CHEMICAL LIBRARY

NOV 1 2 1931

AMERICAN JOURNAL *of* PHARMACY

SINCE 1825

A Record of the Progress of Pharmacy and the Allied Sciences

COMMITTEE ON PUBLICATION

Charles H. LaWall, Ph. M., Sc. D. Joseph W. England, Ph. M. J. W. Sturmer, Pharm. D.
John K. Thum, Ph. M. Arno Viehoever, Ph. D. E. Fullerton Cook, Ph. M.

IVOR GRIFFITH, Ph. M., Editor
Frederick B. Kilmer, Ph. M., Special Contributor

Vol. 103 **OCTOBER, 1931** **No. 10**

CONTENTS

Editorial:
Today and Tomorrow in Pharmacy 543
Selected Editorial:
Devils, Drugs and Doctors 549
Original Articles:
Procaine Borate. By George W. Collins, Chicago, Ill. 555
Radioactivity. (Illustrated.) By George Rosengarten, Philadelphia, Pa. .. 560
What Is Gas? By Freeman P. Stroup, Philadelphia, Pa. 577
Ex-Votos From Belgium. By Chas. Whitehead, Washington, D. C. 594
A Preliminary Study of the Results Obtained in a Prescription Survey Made in Pharmacies in and About Philadelphia 1930-31. By Harrison R. Boggs, Philadelphia, Pa. 596
The Detection of Peroxides in Ether. By L. W. Green and R. E. Schoetzow, Brooklyn, N. Y. 603
Open Display—For Pharmacies and Pharmacists. By John E. Kramer, Philadelphia, Pa. 606
Determination of Phenolphthalein in the Presence of Caffeine and Cinchona Alkaloids and Anthroquinone Bearing Drugs as Applied to Medicinal Tonics 609
Medical and Pharmaceutical Notes 611
News Items 617
Book Reviews 620

Price $3.00 per Annum in Advance **Foreign Postage, 25 Cents Extra**

Single Numbers, 30 Cents. Back Numbers, 50 Cents

Entered as Second-Class Matter at the Post Office at Philadelphia, Pa., Under the Act of March 3, 1879

Acceptance for Mailing at Special Rate of Postage Provided for in Section 1103, Act of October 3, 1917. Authorized February 15, 1920

PUBLISHED MONTHLY BY THE

Philadelphia College of Pharmacy and Science

43d Street and Kingsessing Avenue, West Philadelphia, Pa.

In place of morphine
PANTOPON

Have you Pantopon Powder in stock? Do you know that Pantopon comes in powder form?

You may carry Pantopon hypodermic tablets and, perhaps, Pantopon oral tablets, but you ought to carry Pantopon powder as well, for physicians are prescribing more and more Pantopon in place of morphine. They find its action preferable.

Pantopon is issued not only in hypodermic tablets, oral tablets and ampules, but also in powder form, vials of 1/8, 1/4, 1/2 and one ounce.

If you have Pantopon powder in stock, it would be well to advise your physicians of the fact, for we are continually and extensively advocating its use in place of morphine.

At this time we are suggesting its use particularly in conjunction with Syrup of Thiocol 'Roche', for controlling hard unproductive coughs. In these cases we advise 1/24 gr. Pantopon to the dose.

Order at least an 1/8 oz. vial of PANTOPON POWDER from your wholesaler today

(Narcotic Blank, 1923, Required)

HOFFMANN-LA ROCHE, INC.

Nutley New Jersey

THE AMERICAN
JOURNAL OF PHARMACY

VOL. 103 OCTOBER, 1931 NO. 10

EDITORIAL

TODAY AND TOMORROW IN PHARMACY

WISE IS the pharmacist who, when he arrives at his store in the morning, begins to look about that he may learn what has happened in the world over night. In these days changes come swiftly. The whole practice of medicine and surgery is in constant flux and flow, the outcome of which vitally affects Pharmacy.

The evolution and the revolutions in medical practice, the swiftly changing habits of our people within the opening decades of the present century have already greatly changed the sale and dispensing of medicines.

The changes of today point to still further and still greater change. The pharmacist may well look about and see where he stands today in preparation for the coming conditions of tomorrow. We can only glance at a few of them.

MORE GOVERNMENT CONTROL

Pharmacists have become quite inured to government control. A druggist states that before he dispenses a narcotic or sells a pint of alcohol he rings up the revenue collector for advice. Every drug or chemical which passes through his hands is in one way or another governed by law and regulation.

A movement is under way looking toward a national department of health, which will take over and control not only the practice of medicine, but the practice of pharmacy. It will have jurisdiction over medical colleges, schools of pharmacy, hospitals, dispensaries and the prescription counter.

Social insurance, which is allied to government control, is in operation in certain European countries. Under social insurance schemes

the druggist becomes a dispenser or purveyor for the state. In England, where health insurance has been in practice for some years, the pharmacist has become a "panel" dispenser. The medicines dispensed are kept at the lowest possible cost, and are known as "insurance quality."

If such an insurance plan is inaugurated in this country, it is estimated that from ten to twenty million people will come under its provisions; in other words, this number of people will be taken from the pharmacist's regular patrons and their medical wants will be cared for by the State. In England, the average price for a "panel" prescription equals about twenty-two cents in our money.

We are told that there are more than two million enactments in our Statute books intended to regulate and control the conduct of mankind. Many of these laws directly and vitally affect the activities of the drug store. There are more to follow.

More and more, sometimes swiftly, the health and well-being of our citizens is coming to be guarded, controlled and regulated by the State. The food which we eat, the clothes which we wear, and many of the commodities which we use are, in one way or another, under the purvey of the law. In the drug store, the sale and dispensing of certain narcotics, dangerous poisons and alcoholic liquors are carried out under regulations. There remain whole classes of medicinal preparations which are the subject of controversy in medical and pharmaceutical circles, and the traffic in which lies at loose ends. Patent medicines, nostrums, package medicines, secret medicines, proprietary preparations—everything that is intended for the cure or relief of the ailments of mankind or for the preservation of his health will pass under control. Their manufacture will be licensed. Their formulas will be open. Their labels will be made truthful. Their dispensing and sale will be confined to licensed, registered pharmacists. But the druggist who sells and dispenses them will be held accountable for their value and their integrity.

We may well anticipate that a great change must take place in the traffic in medicinal substances and preparations.

CERTAIN BUSINESS WIPED OUT

There is now in operation one well-known system of governmental control of medicine—the venereal disease control (inaugurated during the war). This has markedly affected the drug trade. Venereal diseases are now treated at the clinic. Rarely does the pharmacist dispense a prescrip-

tion for this class of patients, and the over-counter sale of remedies for these maladies has practically ceased.

Victims of the "great white plague," who were formerly steady patrons of the drug store, are now treated at a sanitarium, and the sale of "consumption cures" has correspondingly diminished.

Industrial medicine is now making rapid strides, establishing hospitals, clinics, dispensaries, nursing centers and health bureaus in many industries.

Group medicine examines and treats patients by wholesale instead of by retail. Instead of six different doctors with six different prescriptions, in group medicine there is one composite physician, diagnosis and treatment.

Hospitals are increasing in number and in size, and there is a marked change in their method. They are rapidly changing from charitable to business institutions, equipped with laboratories, dispensaries, clinics, and with machinery. Patients are not released from hospitals until reconstructed—made as fit for their old occupation as they were before illness, or else trained for a new vocation. This tends to eliminate the large class of convalescent and chronic invalids who were heretofore drug store patrons.

More and more the use of drugs as curative agents by the medical profession seems to recede. Instead of a prescription to be filled at the drug store, the patient goes to the hospital to receive doses of heliotherapeutic rays, prescribed according to the spectrum. He is dieted instead of drugged.

In the treatment of disease the trend of modern medicine seems to be away from drugs and the drug store.

NEW AVENUES OF TRADE

The shift in the activities now taking place in the practice of medicine offers unusual opportunities for pharmacy. While the dispensing and sale of drugs along certain lines are disturbed, new avenues are opened up, new methods adopted, new customers are developed for the drug store, a few of which may be noted. Recently the Surgeon General of the Public Health Service has issued a call to pharmacy to take part in spreading the knowledge and practice of first aid.

In industry the emergency care of the injured has reached a high point. Through organized systems millions of dollars are saved, and untold losses of time through suffering are prevented. First aid is on a paying basis in industry. First aid with the laity remains an un-

worked field. It has yet to reach the small shop, the store, hotel, automobile or the home.

First aid will not fulfil its mission until every man, woman and child has a knowledge of the proper measures of relief, and has at hand the materials to be applied. Millions of accidents are occurring annually in homes and among our congested traffic. It should be the druggist's profitable duty to see that every family and every motor car are equipped with first-aid outfits.

In first aid and allied lines lie millions of dollars' worth of unfilled needs.

PUBLIC HEALTH The Surgeon General of the United States Public Health Service has called upon Pharmacy to take an active part in the work of caring for the public health. This opens up a vast field of activity for the pharmacist, and means new patrons for the drug store. It includes the prevention of the spread of communicable disease, not only by public measures, but in the home and by the individual. In its practical application comes prophylaxis, immunity, the use of serums. It means the use of cleanliness and disinfection in the home, before, during and after communicable disease; the disinfection of the case for food and water supplies; the destruction of insects as carriers of disease; the disinfection of stables, coops and kennels where animals are kept; and the guarding of animals themselves. It includes sanitary measures in the home, for the traveller, for the tourist, and in the camp. The practical application of public health measures points directly to the drug store.

MODERN HYGIENE Closely allied to public health come modern movements in hygiene. Here we reach into the home, parental care, mothercraft. In this is embraced the care of the child from the time of birth on through the pre-school period, and calls for the early treatment of defects of vision, throat, teeth, skin, and numerous other complications of childhood.

The necessity for vaccination and the proper selection of milk and other foods come under this activity.

Child welfare clinics are being established throughout the land under the patronage of Federal and State government. Mothers of all classes are being instructed as to the care of babies, the necessity for cleanliness and the proper use of toilet articles.

Closely related is the work of such organizations as the Modern Health Crusaders, which undertakes to teach to the young habits of health, including personal cleanliness, with drills in washing, bathing, hair combing and teeth brushing. The basis of this work lies in health education. Propaganda for the promotion of public health, prevention of disease and improvement of social conditions, through local societies and through magazines, pamphlets, leaflets and health exhibits. A knowledge of hygiene, sanitation and health measures is to be carried to all the people.

A GOLD MINE

The pharmacist is necessarily and vitally interested in the matter of health education, as health education is a form of advertising. The pharmacist is, or should be, by right of tradition, the center of health education. In these organized movements there would seem to be a mine for the wise druggist. Think of every prospective mother who is taught to anticipate her needs at the time of parturition; of the millions of babies for whom there will be created needs for infant foods, toilet wares and what not, to keep them well and in comfort. Think of the millions of boys and girls who will learn to use a toothbrush and toothpaste three times a day; of the millions who will now, if never before, get the habit of using brushes, combs, lotions, washes, and toilet soaps.

The druggist should sell a hundred toothbrushes in the place of an occasional bottle of toothache drops. He ought to sell thousands of dollars' worth of goods to keep the body in good repair, in place of a quarter dollar box of skin ointment. He will have a chance to market gross upon gross of infant foods and other baby needs in lieu of a few doses. He will purvey "keep well" things by wholesale, rather than drugs in small vials.

MILLIONS OF NEW CUSTOMERS

Greater than all is the trend of the practice that aims to keep the man on the job—to keep people well, beginning with periodical health examination and including personal hygiene. Every man, woman and child, when this system shall come into play, will in one way or another be joined up in a health crusade. There will be health clubs, health centers, community nursing and practitioners of preventive medicine at every crossroads.

All this means a change—a great change. Disease and death must still be faced and drugs will be used and will be wanted as long as

man stays man, but the newer medicine will create a new army of drug store customers—millions of them—who will come for things to keep them well.

THE OPPORTUNITY OF PHARMACY

This rather cursory review of the activities which are now taking place in modern medicine makes it apparent that the drug store has an unusual opportunity. It is evident that there will be a shifting and a change in the trade. The sale and dispensing along certain lines will be disturbed, but new customers will be developed, new avenues opened up and new methods adopted.

It is surely an opportunity for the pharmacist and the drug trade to enlarge their vision and to become the vanguard in modern health activities.

FRED B. KILMER.

SELECTED EDITORIAL

PHARMACY, A PROFESSION OF SERVICE*

By Howard W. Haggard, M. D.

TOMORROW is the opening day of National Pharmacy Week—the seventh annual observance of a custom which started in this country but which has now become international.

And so, I want to pay a tribute tonight—a sincere tribute to the followers of the oldest branch of the medical profession. And yet it is hardly a branch; rather it is the root from which all medical science has sprung and grown. I refer to the profession of pharmacy. My tribute is to the pharmacists of America.

The greatest tribute that ever can be paid to this honored profession lies in its own history. The record of its achievements is one that few professions can approach; it is a record of fundamental contributions to human welfare and human progress. There are few institutions that have a longer history than pharmacy, few that have a more romantic and thrilling one, and none that has a record of greater devotion and service to the needs of mankind.

The pharmacist of today carries on a tradition that arose from religion; his code of professional ethics is a theology binding upon him and jealously guarded by him. His conception of service, his conception of a duty to sacrifice self to the needs of others could have arisen from no other source than religion. And we find it so when we go back to the beginning of pharmacy. And that beginning is in those early days, dim now in the mist of antiquity, when the land upon which ancient Rome was to rise was a wilderness, before Greece was a nation, long before the first pyramid was built, and when civilization had hardly yet begun. In those ancient, ancient times medicine was pharmacy and pharmacy was religion.

A Profession That Arose From Religion

By the men who lived then it was believed that all misfortunes that befell them arose from the influence exerted upon them and their surroundings by spirits—ghosts, malign beings that wished them evil

*A Radio Broadcast delivered by Dr. Howard W. Haggard as a "tribute to the oldest branch of the medical profession" in connection with National Pharmacy Week.

and brought them evil. The priests of their primitive religion attempted to propitiate the spirits or frighten them away and so to prevent or remedy misfortune.

Disease was one of man's misfortunes, caused, they believed, like all others by evil spirits that had taken possession of his body—possessed him. Since disease was a spiritual matter, it was only logical that the priests should be the ones who gave their services to treating disease. To this end one of their methods was to make the man's body and his surroundings as unpleasant as possible for the spirits that tormented him with disease and suffering, thus hoping to drive them away. They performed mysterious rites over him, made a noise to frighten off the spirits, and administered to the sufferer herbs and roots and berries as unpleasant as possible in order to make his body distasteful to the spirits that inhabited it.

Now among these herbs and roots applied for spiritual reasons some few had an unexpectedly great efficiency in the relief of suffering. By chance these priests had stumbled upon true remedial herbs. But they interpreted their action as frightening off the demons of pain and bringing a blessed respite from suffering. By the same logic others drove out the demons of insomnia and let the goddess of sleep have her sway; still others, when applied to wounds, kept out the evil spirits that festered the flesh and prevented healing. However erroneous their beliefs, the priests of this primitive religion were quick to note and to record in their tradition the benefits of the remedies that chance had put into their hands.

The priests prepared these remedies and applied them. They devoted their lives to the service of their afflicted fellow-men. They were the first pharmacists. It is from them down through the ages that pharmacy has come, carrying with it inseparably a tradition of service freely given and a code of ethics jealously preserved. Pharmacy has grown now into a science of wide usefulness but its aims, its duties, and its principles have remained unaltered throughout the centuries.

The pharmacists of today, safeguarded by laws and regulations advocated by their own ethics, occupy in our midst a position of minor priesthood. Whether or not we are conscious of this fact, we nevertheless accept them as such—and our faith in them is not misplaced.

Devotion to an Ancient Tradition

Pharmacy has never deviated from the ancient tradition of its purpose—to prepare and compound the medicaments which prevent, control, and cure disease and relieve suffering. But from time to time

some of its attributes have grown into uses other than those specified in its tradition, important commercial uses. One of the most striking features of its history is the way it has given birth to other sciences. Pharmacy is the mother of botany; it is the mother of chemistry. These children of pharmacy, long since separated from the mother science, have launched out on careers for themselves. Oftentimes, as is the way with children, they have forgotten the debt to their mother, pharmacy. The pharmacists ask no share in their success; they ask merely just recognition of the fact that theirs is a profession from which have grown some of the great sciences upon which we depend for our material civilization.

Chemistry, that science that has done and is doing so much for our wealth and comfort—we live in the chemical age—is an offshoot from pharmacy. Chemistry grew out of alchemy and alchemy, with its search for the elixir of life and the philosopher's stone that would transmute base metals into gold, grew out of pharmacy. It was born in the back room of an apothecary's shop but separated from pharmacy when it grew to disregard the ancient professional tradition and ethics from which pharmacy has never deviated.

A World Famous Pharmacist

Here is a story that brings the point more nearly to our own time. It is an incident from the life of a pharmacist who lived a hundred and fifty years ago, but who in his ideas of professional service was just such a pharmacist as you have in your own neighborhood drug store. He spent his life in a Swedish apothecary shop. He compounded prescriptions, but he did more than that; he did what your own pharmacist does freely as part of his duty in a profession of service; he shared without recompense the information in matters of public health that he had acquired from years of study. He gave his time freely to any one who came to his shop. No other profession, except it be religion, imposes such a duty of service upon its members.

This Swedish pharmacist's name was Carl Scheele. He bequeathed to the world great discoveries made in his apothecary shop and he gave them as freely as the service rendered across the counters to his patrons. In his Swedish town he was respected and beloved. When the widow who owned the shop where he worked decided to close the establishment, the people of the neighborhood offered to open for him a shop of his own. Their trust was a sincere tribute to the

pharmacist—for it was solely as a pharmacist that these people knew him. They did not recognize that he was a man destined to become a world figure in science. Nor was such fame sought by Carl Scheele; his life was devoted to pharmacy and service to his community.

In his spare time, the moments when there were no prescriptions to fill, when there was no one waiting at the counter to seek his advice, and when the shop lights had been put out for the night, he worked to satisfy his own insatiable curiosity concerning the properties of the materials with which he dealt.

Industry Revolutionized by Discoveries in Pharmacy

He performed experiments, and from them came astonishing discoveries. One day he heated together a certain powdered mineral and an acid; he observed that a greenish-yellow gas was evolved. He collected some of this gas in a bladder. The fumes made him cough and nearly blinded him. He had discovered the gas chlorine.

From this discovery there came a revolution in the bleaching industry. Instead of soaking cloth in sour milk and boiling lye, and exposing it to the sun for weeks or months it could be bleached in a few hours in the new gas that Carl Scheele, the pharmacist, had discovered. The water which your city supplies to you is most probably made safe and free from any source of infection, by this same chlorine gas. But these are matters aside from the profession of pharmacy and so they and the millions of dollars they represent have passed into other hands. Scheele did not profit from his discoveries except in fame. The last days of his life were spent in an apothecary shop.

Carl Scheele discovered among many things the substance glycerine. He was led to this discovery by observing a then unknown oily liquid which separated from the materials he used in preparing a healing plaster. His scientific curiosity led him to seek its source; he was soon able to make glycerine from vegetable oils. His discovery has added millions to the chemical industry, for this glycerine is now a very valuable by-product in the commercial manufacture of soap. So valuable in fact have Scheele's discoveries been to industrial chemistry that chemists have adopted him as one of them; they have forgotten that he was first and last a pharmacist and that his discoveries were made during the preparation of pharmaceutical products.

Can you wonder, then, that the pharmacists felt that the profession in which they have a strong and just pride was slighted, and unfairly so, when in 1929, the sesquicentennial of Scheele's discovery

of glycerine, an association representing a great division of industrial chemistry sent a congratulatory message to Crown Prince Adolph of Sweden, acknowledging a debt to Scheele? For in so doing it had presumed he was a chemist and had made no acknowledgment of the fact that he was a pharmacist or that glycerine was discovered as a side issue to the filling of a prescription.

It is with this same feeling of pride in profession, a desire for just recognition of their achievements, that the pharmacists now devote a week each year, National Pharmacy Week, in the interest of a better and wider understanding of their profession, their aims, their ambitions, and the service that they render to public welfare and public health.

A Penalty for Service Freely Given

This very service that the pharmacists render the people of America has tended to obscure their high professional standing. We look upon the pharmacist and the pharmacy in a light different from that of any other profession or institution. We have grown to expect, until we now accept as our right, a service in a drug store that we do not ask or expect from any other institution. We look upon the pharmacist as a public servant. How many times have you passed by all other places to ask a question, obtain a service of obligation from a pharmacist? You feel that it is your privilege to do so. But how about the pharmacist? He does not fence himself about with formal pretentions that cultivate a sense of professional aloofness; he meets you at all times at his counter ready and eager to render to you his service even though it be service at a loss to him; he stocks his shelves with many things far removed from medicine not alone because of economic pressure but because of your demands for this added service. A public servant, even when the duty is self imposed, is at a disadvantage in a democratic country. Familiarity that grows from a sense of possession—the feeling that the pharmacist and his shop are yours to command—has given rise in the minds of some people to the idea that the pharmacist is only a semi-professional man. And that idea the pharmacists quite naturally resent.

You who accept freely the service that the pharmacist renders to you sometimes forget that he is a trained man, with pride of profession, one who in college has studied exhaustively in chemistry, toxicology, physiology, Latin, and many other subjects far removed from the mere technique of mixing medicaments. In addition to his college

training each pharmacist serves an apprenticeship in practical experience and finally undergoes a very rigorous State examination. Then and then only does the State proclaim him qualified to prepare medicaments and dispense them.

It is the pharmacists themselves who have been instrumental in bringing about these exceptionally high qualifications and requirements for entrance into their profession. And why have they done so? Because pharmacy is not merely the mixing of drugs, the following of a recipe written by a physician. The pharmacist stands as a safeguard to your health and life. The pharmacist must know the purity of every ingredient he uses; to this end he has been one of our strongest forces in bringing about the laws governing the purity of foods and drugs. He must know the action on the body of each medicament that he dispenses. He must assure himself that the amounts prescribed by the physician are the correct ones. Legally and morally he shares a responsibility as great as the physician's. He must not fail the public; your very lives are in his hands. It is to meet this requirement and to prevent any blot upon a cherished profession that the pharmacists themselves have advocated the laws imposing a high standard of education for entrance to their profession.

The pharmacist does not fail the trust imposed upon him. He has the confidence of the public. But he is entitled also to a public recognition of the high professional standing and dignity of his calling. And so the pharmacists take the opportunity this week—National Pharmacy Week—to demonstrate to you some of the things that their profession represents.

Just Tribute to an Honored Profession

My tribute here to the pharmacists of America and to the ancient and honored profession of pharmacy is one of words only, words sincerely spoken. But let your tribute be one of acts. You have accepted freely the service that pharmacy extends to you; in return is it not just that you devote a few minutes to becoming better acquainted with the profession of your pharmacist? Examine the displays and exhibits prepared for your inspection during National Pharmacy Week. You will understand then why it is so important that only pharmacists who have had years of specialized education and practical training shall be in a position to serve you in a capacity upon which health and even life may depend. Pay your tribute to the profession of pharmacy and to its priests, the pharmacists of America.

ORIGINAL ARTICLES

PROCAINE BORATE

Report of an Examination and Standardization of a Nonproprietary Brand

By George W. Collins*

PROCAINE BORATE was introduced in England a few years ago by the British Drug House, Ltd., as a local anesthetic. Later on it was presented in this country by Sharp & Dohme under the proprietary name, "Borocaine." At that time the product was examined in the A. M. A. Chemical Laboratory. The report [1] brought out that the compound appeared to be a simple borate which was formed by combination of procaine and boric acid and was probably the same substance as described in German literature many years ago; furthermore, that the structural formulas given by workers in both Great Britain and Germany were presumably incorrect. The crystallographic properties of the product were described. It was concluded from the work done that the compound possessed the expected formula, $C_{13}H_{20}O_2N_2.5HBO_2$; that it was not a new discovery but a rediscovery of an old substance. Subsequently, the Council [2] on Pharmacy and Chemistry of the American Medical Association declared Borocaine unacceptable for "New and Nonofficial Remedies" [3] because the application of a proprietary name to procaine borate was not considered to be in the interests of rational therapeutics.

A few months ago there was submitted to the Council on Pharmacy and Chemistry a nonproprietary brand of procaine borate. It was in this connection that the A. M. A. Chemical Laboratory was

*Contribution from the American Medical Association Chemical Laboratory, Chicago, Ill.

[1] Collins, G. W.: "The Composition of Procaine Borate (Borocaine)," *J. A. M. A.*, 90, 25 (1928).

[2] Report of the Council: *J. A. M. A.*, 93, 1309 (Oct., 26, 1929).

[3] Generally abbreviated N. N. R. A volume published annually by the Council on Pharmacy and Chemistry. It describes those nonofficial remedies which have promise of merit and are marketed in accordance with the rules of the Council.

asked not only to investigate its chemical composition but, if the preparation was found acceptable, to evaluate suitable standards. A history of the preparation of procaine borate may be found in a previous article from this laboratory.[1] Recent work on the use of procaine borate as a local anesthetic, particularly as to its application in operative dentistry, has been reported by Dailey, Benedict, Freeman and co-workers.[4]

Chemical Examination

The specimen of procaine borate presented occurred as a fine, white, crystalline powder, with a faint yellow tint, possessing a slight foreign odor, freely soluble in water, about 1 in 4, and alcohol, insoluble in acetone, benzene, chloroform and ether. The product was found to melt at 153° to 157° C., the melting point being indefinite and several degrees lower than that heretofore reported.[1,5,6,7] An aqueous solution of procaine borate made distinctly alkaline with sodium hydroxide precipitated procaine[8] (base), *p*-aminobenzoyl-diethylaminoethanol, as an oily residue. The substance when dissolved in water dissociated hydrolytically; on extraction of the aqueous solution directly with six successive portions of an immiscible solvent, such as chloroform, approximately 95 per cent. of the theoretical amount of *p*-aminobenzoyl-diethylaminoethanol (procaine) was removed. When the dried substance was percolated directly with chloroform it yielded approximately 1.7 per cent. of procaine. It was also demonstrated that on shaking a quantity of the powder with chloroform, there was detected a considerable amount of free uncombined procaine (base), *p*-aminobenzoyl-diethylaminoethanol, approximately 4.8 per cent., and also traces of uncombined boric acid. The results of the quantitative determinations are recorded in the accompanying table.

[4] Dailey, H. T., Benedict, H. C., Freeman, C. W., and Arnin, S. S.: "Studies in Local Anesthetics," *Dental Cosmos*, LXXI (1929) 704, 861, 866, 945, 949.

[5] Einhorn, A., und Uhlfelder, E.: Über den *p*-Aminobenzoesäure-diäthylamino-und-piperidoäthylester, *Annalen de Chemie*, 371, 131 (1910).

[6] Copeland, A. J., and Notton, H. E. F.: Borocaines, New Class of Local Anæsthetics, *British Medical Journal*, 2, 547 (Sept. 26) 1925.

[7] Watson-Williams, E.: Borocaine, A New Local Anaesthetic, *Lancet*, 1, 16 (Jan. 2) 1926.

[8] In this article the word "procaine" refers to the base.

TABLE

ANALYSIS OF PROCAINE BORATE

	Theory $C_{13}H_{20}O_2N_2$. 5 HBO_2	Undried Specimen	Calculated to the dried Specimen	Variance from Theory
Moisture (Loss over Sulphuric Acid)		0.51		
Nitrogen, N	6.15[1]	6.15	6.18	
m-Boric Acid, HBO_2[2]	48.17	45.28	45.50	—5.54
Procaine (Base), $C_{13}H_{20}O_2N_2$[3]	51.82	49.83	50.11	—3.29

From the results of the analytic data it appeared that the product of the American manufacturer consisted essentially of the procaine borate, $C_6H_4.NH_2COO.C_2H_4.N(C_2H_5)_2.5HBO_2$, and in most respects conformed with the product previously examined in the A. M. A. Chemical Laboratory.[1] It did, however, contain an unnecessary amount of uncombined *p*-aminobenzoyl-diethylaminoethanol and boric acid, and as previously stated there was a discrepancy in the melting point.

The firm was informed of the findings of the A. M. A. Chemical Laboratory, including the discrepancy, and also was sent the proposed standards which the laboratory had evaluated. In due time, and after its own investigation, the firm informed the Council that it was manufacturing a product which now complied in full with the standards which the laboratory had prepared and that the new product did not contain any uncombined procaine or boric acid. The laboratory then examined a second specimen and found it to be satisfactory in these respects.

Standards

The following standards were adopted by the Council on Pharmacy and Chemistry for its inclusion in "New and Nonofficial Remedies":

PROCAINE BORATE—1-aminobenzoyl-2-diethylaminoethanolpenta-*m*-borate; β-diethylaminoethyl-*p*-aminobenzoate-penta-*m*-borate. $C_6H_4.NH_2COO.C_2H_4.N(C_2H_5)_2.5HBO_2$.—A borate formed by the interaction of *p*-aminobenzoyl-diethylaminoethanol (procaine base)

[1] Figures are reported in terms of percentage.

[2] *m*-Boric acid, HBO_2, was determined by distillation with methyl alcohol and subsequent titration.

[3] Procaine (base), $C_{13}H_{20}O_2N_2$, was determined by extraction with chloroform from an alkaline aqueous solution and subsequent titration.

and boric acid in the same organic solvent. Procaine borate contains 51.8 per cent. of *p*-aminobenzoyl-diethylaminoethanol.

Actions and Uses—Procaine borate closely resembles procaine hydrochloride in its actions and uses. The molecule is heavier than that of procaine hydrochloride, but the toxicity and the anesthetic activity are closely proportional to the procaine base which they contain. When injected subcutaneously, procaine borate exerts a prompt and powerful anesthetic action. It is nonirritant. The testimony concerning its activity when applied to mucous membranes lacks uniformity.

Dosage—For infiltration anesthesia, solutions of 0.5 to 1 per cent.; for blocking nerves, from 1 to 2 per cent.; for tonsillectomy, 0.5 to 1 per cent.; mucous surfaces, 2 to 20 per cent., dependent on the location and the depth of anesthesia required. Its action is enhanced by the addition of a small amount of epinephrine, as in the case of procaine hydrochloride. Owing to the smaller content of the base in procaine borate, the total dose may exceed that of procaine hydrochloride by about 50 per cent.

Procaine borate occurs as a fine, white, odorless, crystalline powder; when applied to the tongue, it possesses a slightly bitter taste, followed by a sense of numbness; permanent in air; freely soluble in water, about 1 in 4, soluble in alcohol; insoluble in acetone, benzene, chloroform and ether. Its aqueous solution (1 in 10) is alkaline to litmus, dissociating hydrolytically. Procaine borate "melts" at 163° to 166° C.

Transfer about 1 gm. of procaine borate to a suitable Squibb separatory funnel, add 25 cc. of water, followed by the addition of 5 cc. of normal sodium hydroxide solution and extract with 3 successive portions of chloroform, using 25 cc., 20 cc. and 10 cc., respectively; evaporate the combined chloroformic solutions to dryness, dissolve the oily semisolid base in 25 cc. of a 2 per cent. solution of hydrochloric acid: portions of the solution respond to the tests for procaine hydrochloride, U. S. P. X, page 305. Dissolve 0.1 gm. of procaine borate in 2 cc. of methyl alcohol, add 5 drops of sulphuric acid and ignite the mixture: a green mantle is imparted to the flame. Dissolve 0.5 gm. of procaine borate in 50 cc. of water: separate portions of 10 cc. each yield no opalescence with 1 cc. of diluted nitric acid and 1 cc. of silver nitrate solution (*chloride*); no turbidity with 1 cc. of diluted hydrochloric acid and 1 cc. of barium chloride solution (*sulphate*); no coloration or precipitation on saturation with hydrogen sulphide (*salts*

of heavy metals). When tested for arsenic according to the U. S. Pharmacopœia X, the product should meet requirements for arsenic (p. 428, Arsenic Test). Transfer about 0.5 gm., procaine borate, accurately weighed, to a 50 cc. glass-stoppered cylinder, add 25 cc. of chloroform and shake the cylinder and contents for five minutes; allow to stand until the insoluble portion separates; filter, wash the cylinder and the insoluble material onto the filter with two portions of chloroform, using 15 cc. and 10 cc., respectively, adding the washings to the original filtrate; evaporate the combined filtrates to dryness in a tared beaker and dry to constant weight over sulphuric acid in a partially exhausted desiccator: the oily residue should not exceed 2 per cent. (*limit of uncombined p-aminobenzoyl-diethylaminoethanol*).

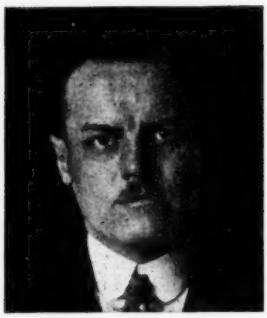
Dry about 1 gm. of procaine borate, accurately weighed, over sulphuric acid in a partially exhausted desiccator for forty-eight hours: the loss does not exceed 2 per cent. Transfer about 0.4 gm. of procaine borate, accurately weighed, to a suitable Squibb separatory funnel, add 25 cc. of water, followed by the addition of 2 cc. of normal sodium hydroxide solution, extract with six successive portions of chloroform, using 25 cc., 20 cc., 15 cc., 10 cc., 10 cc. and 10 cc., respectively, evaporate the combined chloroformic solutions to dryness in a stream of warm air, and dry to constant weight over sulphuric acid in a partially exhausted desiccator; dissolve the oily residue in about 10 cc. of previously neutralized alcohol, add 10 cc. of tenth-normal hydrochloric acid solution, followed by the addition of an equal volume of water; determined the excess of acid by titration with fiftieth-normal sodium hydroxide solution, using methyl red as an indicator: the amount of tenth-normal hydrochloric acid solution consumed corresponds to not less than 50.0 per cent. nor more than 52.0 per cent., *p*-aminobenzoyl-diethylaminoethanol, calculated to the dried substance. Transfer about 0.4 gm. of procaine borate to a steam distillation apparatus and determine the *m*-boric acid according to the Gladding method of distillation and subsequent titration (see Leach, Food Inspection and Analysis, ed. 4, p. 884): the amount of tenth-normal sodium hydroxide solution consumed corresponds to not less than 47.0 per cent. nor more than 48.5 per cent., *m*-boric acid (HBO_2), calculated to the dried substance.

RADIOACTIVITY*

By George Rosengarten

Assistant Professor of Physics, Philadelphia College of Pharmacy and Science

THE EARTH is one billion and a half years old. Man has been engaged during four thousand years in unraveling its secrets. He has studied its motion, its size, and the constitution of the matter out of which it is formed. The Science of Radioactivity is a comparatively new science and dates from the discovery in 1896 by Professor Henri Becquerel that compounds of uranium emitted peculiar radiations which produced an effect, similar to light rays, upon the photographic plate. X-rays were discovered in the preceding year. Both discoveries opened new fields for investigation and have given us a new concept of the constitution of matter.



George Rosengarten

The alchemists, who preceded the modern chemists, believed in the transmutation of the elements and sought in vain to produce gold from the baser elements which existed in greater quantities. They left us the germ of an important idea which considered the different forms of matter as built out of some kind of unit particle, the successive addition of which produced new substances.

ATOMS AND MOLECULES

With the advent of chemistry, elements were observed to enter into combination with one another always in definite proportions. This could best be explained by considering each element to consist of very minute particles called atoms which combined to form molecules. Common table salt consists of small crystals, plainly visible to the unaided eye, which the chemist has shown to contain the elements sodium and chlorine. An atom of sodium appears to combine with an atom of chlorine to form a molecule of sodium chloride and these atoms arrange themselves in a definite order producing a beautiful crystal of salt. That

*One of a Series of Popular Science Lectures given at the Philadelphia College of Pharmacy and Science, 1931 Season.

these atoms and molecules are in motion may be observed by examining, under the microscope, water in which some finely divided material is held in suspension. The minute particles appear to be moving backward and forward with unceasing motion. This was the discovery of Robert Brown, known as the Brownian movement, and is explained as being due to the incessant bombardment of the suspended particles by the molecules of the liquid. Observations such as these have firmly established the existence of atoms and molecules.

ELEMENTS

Gold, silver, mercury, oxygen, hydrogen, and helium are some of the ninety different kinds of matter, called elements, which the chemist has discovered.

How many such elements exist?

It is possible to arrange the elements found upon the earth in the order of their relative atomic weight starting with the lightest known element, hydrogen, as number one. Helium is number two, having an atomic weight four times that of hydrogen. In this manner we may continue until we reach the heaviest known element, uranium, which is number ninety-two, with an atomic weight about 238 times that of hydrogen. In the science of radioactivity we are particularly interested in the elements of high atomic weight (Table I).

TABLE I

ELEMENTS OF HIGH ATOMIC WEIGHT

Atomic Number	*Name*	*Atomic Weight*
78	Platinum	195.23
79	Gold	197.2
80	Mercury	200.61
81	Thallium	204.4
82	Lead	207.2
83	Bismuth	209
84	Polonium	210
85	(?)	
86	Radon	222
87	(?)	
88	Radium	225.95
89	Actinium	229

NOTE: Elements 85 and 87 have not been obtained.

Atomic Number	*Name*	*Atomic Weight*
90	Thorium	232.15
91	Uranium X2	234
92	Uranium	238.17

The relative atomic weights having been determined with great accuracy, the indications were that the different forms of matter were built up from a common element, perhaps hydrogen, which has the smallest atomic weight. This assumption of the existence of molecules and atoms while it accounts for the reactions between various substances and the formation of compounds is far from giving us a knowledge of the ultimate constitution of matter.

What is the nature of the Atom?

This is the question which has continually presented itself to the scientific mind. The concept of the atom originated with the chemists,

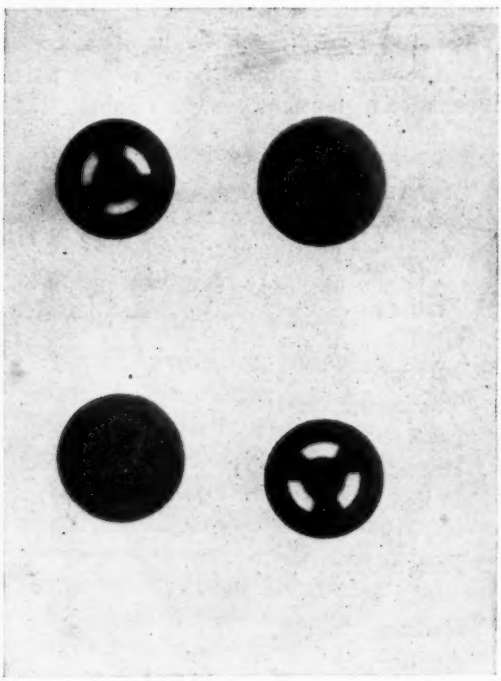


Fig. 1—Coin Shadows With Uranium Screen.

but it remained for the physicists to explain its nature. It was Michael Faraday, about 1835, who demonstrated by the passage of the electric current through a liquid that the atom of matter was always associated with a charge of electricity. The discovery by Henri Becquerel that the salts of the heaviest element uranium possessed properties which had not previously been observed in any other salt gave a new impetus to the investigations concerning the nature of matter. Until the discovery of radioactivity and its explanation the atom remained the smallest conceivable particle of matter. Let us investigate these peculiar properties.

PHOTOGRAPHIC EFFECT

If a piece of the mineral carnotite, which contains among other substances an oxide of uranium, is placed upon a photographic plate that is wrapped in black paper and kept in the dark for several days it will cause a dark-

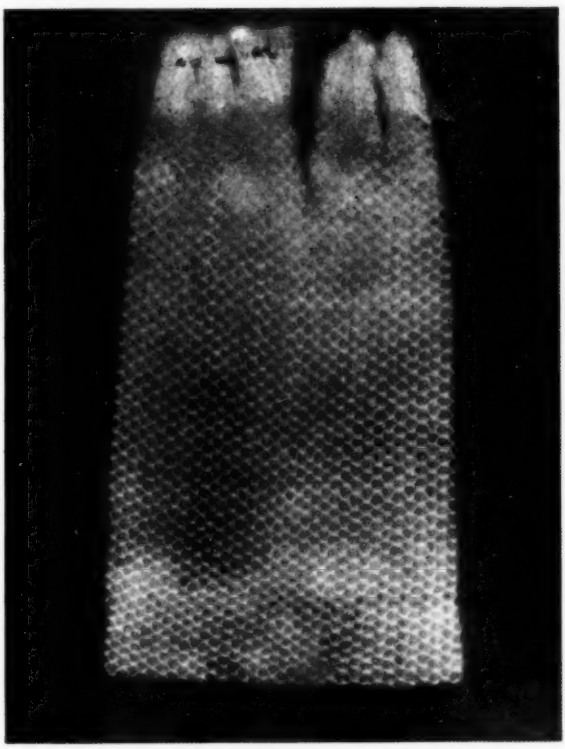


Fig. 2—Mantle Shadows on Photographic Plate.

ening of the photographic plate. Since this is the effect produced by ordinary light rays, Becquerel was led to believe that the uranium gave off some kind of radiation. The X-rays had been observed, in the preceding year, to produce the same effect but in a much shorter time. Could the uranium give off X-rays?

The production of shadow pictures such as shown in Figure 1 can be made by using a uranium screen. This can be made by scattering finely ground carnotite upon a glass plate coated with some form of adhesive. Several coins laid upon a photographic plate and covered by such a uranium screen will develop shadow pictures in about forty-eight to seventy-two hours if kept in the dark. Another very interesting picture may be produced by placing a Welsbach mantle upon a photographic plate and keeping it in the dark for four or five days. Upon development the pattern of the mantle will be found upon the plate (Figure 2), due to an oxide of thorium used in the manufacture of the mantles. We shall see later that thorium as well as uranium is the source of a long list of radioactive substances.

ELECTRIC EFFECT

Another property of radioactive substances is the ability to cause the discharge of an electrified body. This discovery was made by Becquerel and can conveniently be shown by means of an electroscope. This instrument (Figure 3) consists of a gold leaf G mounted in a case and carefully insulated from the earth. The support for the gold leaf terminates in a circular metal disc D in the top of the so-called ionization chamber I. When charged the gold leaf remains at an angle with the metallic support, but upon introducing a radioactive material in the ionization chamber the leaf gradually falls. The rate of fall of the gold leaf indicates the strength of the radioactivity of the material examined. The movement may be observed by means of a telescope and scale determining the time for the gold leaf to move over 100 divisions of the scale.

These phenomena gave an incentive for further investigation, but their explanation had to wait some years. In order to determine whether any element other than uranium possessed the properties of radioactivity G. C. Schmidt and Madame Curie independently made a careful study of a great many substances and found only thorium with an atomic number 90, making it appear that the properties of radioactivity were confined to the heavier and no doubt more complicated atoms.

MADAME CURIE

We must stop to pay tribute to the greatest woman scientist of all time, Marie Sklodowska Curie. She was born in Warsaw, Poland, November 7, 1867, and was very early introduced to scientific investigation, assisting her father. She desired a larger field and went to Paris, where she worked and studied at the Sorbonne. Miss Sklodowska was almost a stranger in the big city, living in very small quarters and assisting herself financially by tutoring and washing bottles in the laboratory. Her industry was rewarded. As laboratory assistant of Pierre Curie and later as Madame Curie she became acquainted with the most recent discoveries in physics and was soon to rise to fame as the discoverer of radium.

To be sure her pathway to success had been blazed by such men as J. J. Thompson, who showed that the cathode rays produced by a discharge of electricity in a vacuum tube were negative particles which

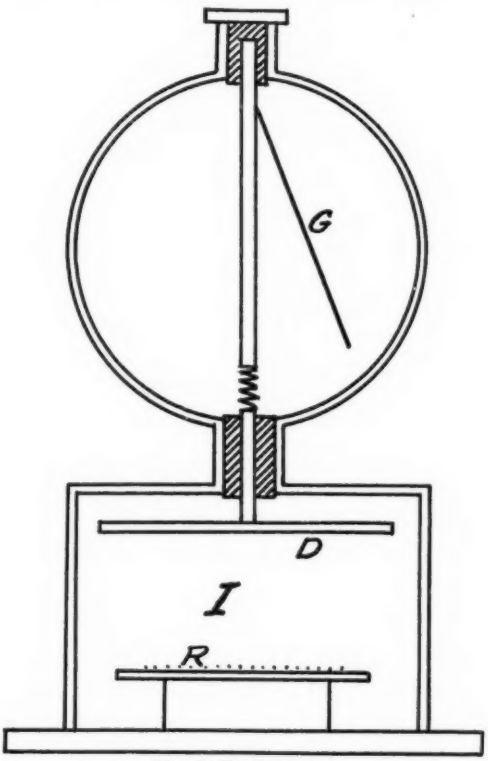


Fig. 3—Electroscope.

he called electrons; by Roentgen, the discoverer of the X-rays, and by Becquerel, who had discovered the radioactive property of the salts of uranium.

Madame Curie took up the search for other substances which might show this peculiar property of radioactivity, but found only the element thorium. During her experiments with the various minerals containing uranium the mineral pitchblende gave indications of being about four times as active as the metal uranium. Since the radioactivity of the uranium ores had been shown to be proportional to the amount of uranium present, such an increased activity she reasoned must be due to the existence in the mineral pitchblende of a still undiscovered element of greater radioactivity than uranium. Large quantities of material were examined and tested, since these substances must exist in very small quantities. She was successful in her search and discovered two new radioactive elements which she named radium and polonium, the latter after the country of her birth.

Careful determination of the atomic weights of these new elements placed them in the periodic table with atomic numbers of 88 and 84 respectively. (See Table 1.) The discovery of radium, which in the pure state is several million times as radioactive as uranium placed Madame Curie and the science of radioactivity in the forefront of modern physics. For her research and discovery Madame Curie has twice been awarded the Nobel Prize indicating in what honor she is held by the scientific world of the twentieth century.

THEORY OF RADIOACTIVITY

Altogether about forty different substances have been found to be radioactive and appear as successive products of the spontaneous disintegration of the elements uranium, thorium, and actinium. To explain the phenomena of radioactivity, Rutherford and Soddy in 1903, advanced the theory that the radioactive elements were not stable like the atoms of the ordinary elements but were breaking up spontaneously with the emission of radiations which have been called the alpha, beta and gamma rays. To understand how these rays can affect the photographic plate or discharge the electroscope it will be necessary to examine them in detail.

ALPHA RAYS

If a plate is coated with phosphorescent zinc sulphide and then exposed to the light it will become temporarily luminescent. Exposure of such a plate to a radioactive substance will show a brilliant luminosity indicating that something

is given off from the radioactive body which has the same property as the light ray in producing this luminescence.

More detailed examination under the miscroscope of a mixture of finely ground carnotite and zinc sulphide indicates that the light is not uniform but consists of scintillating points of light which last for only an instant, to be followed by others without apparent dimunition. It is very easy to construct a simple piece of apparatus devised by Sir William Crookes called the "Spinthariscope" which will show this phenomenon of radioactivity. A small cylindrical box about two inches long may be used for this purpose. The bottom of the box is to be coated with phosphorescent zinc sulphide and a magnifying glass inserted in the top. A minute quantity of radioactive material such as the luminous paint used on watches should be supported just above the center of the zinc sulphide screen. When viewed in the dark each alpha particle emitted by the radioactive substance as it strikes the screen causes a brilliant scintillation. By counting the scintillations from a small quantity of material the number of alpha particles emitted by 1 gram of radium has been determined to be 30,000,000,000 per second. This property of the alpha particle is

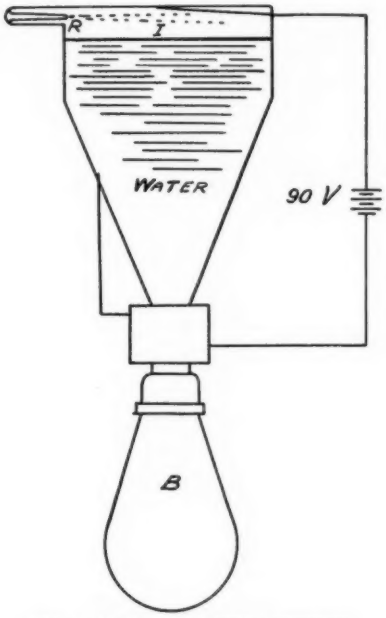


Fig. 4—Alpha Ray Track Apparatus.

employed in the manufacture of luminous paint used on the dials of clocks and watches. By mixing a small quantity of the radioactive material such as radium bromide or more frequently mesothorium with phosphorescent zinc sulphide a luminous powder is produced, due to the bombardment of the crystals of the zinc sulphide by the alpha particles emitted by the radioactive substance.

Can the atom be seen?

We cannot see the atom any more than we can see the force of gravity. We can see the effect. We observe the scintillation each time the atom or the alpha particle strikes the zinc sulphide screen just as we observe the body to fall toward the earth. It is possible to see the actual path of the alpha particles shot off from the radioactive material by a very ingenious scheme developed by C. T. R. Wilson. The passage of the alpha particle through a gas with about one-sixteenth the velocity of light causes the gas molecules to be ionized or broken up into positively and negatively charged particles. Upon these so-called ions water vapor is made to condense and the track of the alpha particle made visible.

The Alpha Ray Track apparatus shown in the diagram (Figure 4) is used in the Physics Laboratory of the Philadelphia College of Pharmacy and Science for demonstrating this phenomena. A glass flask, supplied with a rubber bulb B, is partly filled with water and inverted as shown. At the point R in the space above the water, known as the ionization chamber, a minute quantity of radium is located which continually emits alpha particles into the ionization chamber. By compressing the bulb B the volume of the air in the ionization chamber is reduced and it becomes supersaturated with water vapor. The sudden expansion produced by the release of the bulb causes a lowering of the temperature and a condensation of the water vapor upon any ions which may be present. The high speed alpha particles emitted by the radium cause the molecules of the air to be ionized and it is upon these ions that the water vapor condenses making visible the path of the alpha particle. It is necessary to connect the walls of the glass vessel to a difference of potential of about ninety volts in order to remove the residual ions from the air otherwise the entire space becomes fogged.

The tracks of the alpha particles have been photographed (Figure 5) and show a range of from three to eleven centimeters in air. They appear to be nearly straight lines with an occasional sharp deflection. That the alpha particle has struck something of great mass

is evident and we believe that it must have been the nucleus of an atom of the air. We shall refer to this again in developing our present hypothesis concerning the nature of the atom.

In a powerful magnetic or electric field these alpha particles are deflected from the straight line as if they were positively charged particles moving with very high velocity. These alpha particles are not very penetrating and are easily stopped by a sheet of aluminum one-tenth millimeter in thickness. By collecting the alpha particles given off by the radioactive material it can be shown that they are ionized helium atoms.

BETA RAYS

In addition to the alpha rays we find other radiation given off by the radioactive substances having a very much greater velocity, almost approaching that of light, and deflected in the opposite direction to the alpha particle by an electric field. Such particles must carry a negative charge of electricity. They have very little mass and are easily deflected in passing through a gas but

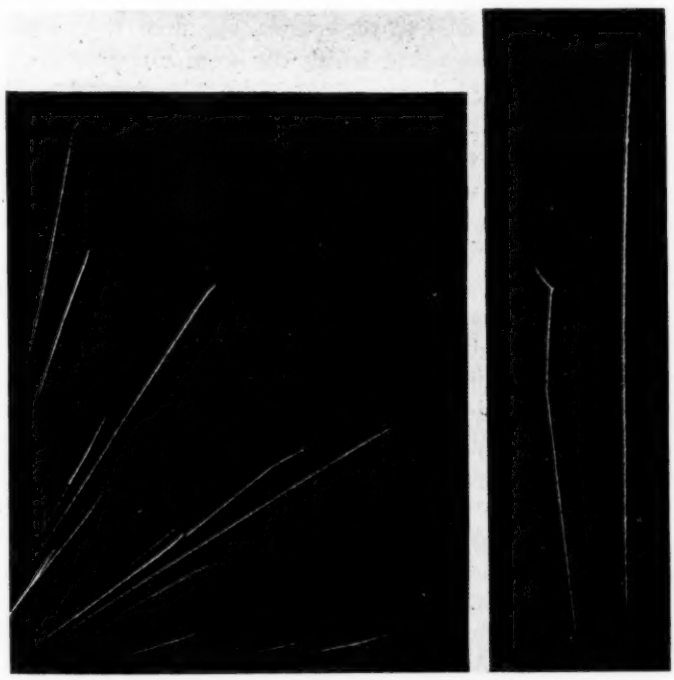


Fig. 5—Tracks of Alpha Particles Shooting Through the Air. Taken From the Electron (R. A. Millikan).

have a penetrating power 100 times that of the alpha particles. Such observations as these seem to indicate that these particles are negatively charged electrons similar to the electrons which constitute the cathode rays in the discharge of electricity through gases.

GAMMA RAYS A third type of radiation is also emitted by the radioactive material which is still more penetrating than either the alpha or the beta rays. It is very similar to X-rays and is able to penetrate several centimeters of lead. This is called the gamma ray and is not deflected by either the electric or magnetic field. It is therefore not charged like the alpha and the beta rays. It is a light ray of very short wave length.

What is the nature of the atom that it can emit these peculiar radiations?

To explain the phenomena of radioactivity as well as to account for the nature of matter in general several different models of the atom have been proposed of which the Bohr-Rutherford atom is perhaps the best. It must be understood that these models represent the feeble attempt of man to reconstruct the atom for no one has observed more than the effect which the atom can produce.

The Bohr-Rutherford Atom is thought to consist of a massive nucleus around which revolve in different orbits the so-called negative electrons. Most of the space occupied by the atom is empty comparable to the space between the planets in our solar system. It is on this account that the alpha particles can pass through millions of atoms before colliding with a nucleus of an atom and suffering a deflection from the straight line path. The nucleus contains the positively charged protons as well as a certain number of electrons.

In the case of hydrogen, the lightest known element, the atom model is exceedingly simple consisting of a positively charged proton as a nucleus around which is revolving a single negative electron. In the case of helium with an atomic weight four times that of hydrogen, the nucleus consists of four protons and two electrons with two additional electrons revolving about the nucleus in very definite orbits. The planetary electrons may jump from one orbit to another and in so doing emit light radiation whenever the electron jumps from an outer to an inner orbit.

The atomic weight is equal to the number of protons in the nucleus while the number of electrons revolving in the various orbits determines the atomic number. The element uranium with an atomic weight of 238 and an atomic number 92 according to the Bohr-Ruth-

erford model must consist of a nucleus of 238 protons about which are revolving in different orbits some 92 electrons. To make the atom electrically neutral there must be an equal number of protons and electrons thus assigning to the nucleus of the uranium atom an additional 146 electrons. If the actual atom is anything like as complicated as the model which we have just conceived it is no wonder that the uranium atom is continually breaking up with the expulsion of helium atoms and the discharge of negative electrons.

At any instant the atom of uranium, whose atomic weight is 238, may explode and send out an alpha particle, which is a helium atom with atomic weight of 4. The resulting atom, known as uranium X, will have an atomic weight of 234 and is likewise unstable.

Uranium equals Uranium X plus Helium

$$(238) = (234) + (4)$$

TABLE II.

Radioactive Series of Elements from Uranium.

Atomic No.	*Element*	*Atomic Weight*	*Decays to ½ Value*	*Rays Emitted*
92	Uranium I	238.18	4,500,000,000 yrs.	Alpha
90	Uranium XI	(234)	24.5 days	Beta
91	Uranium X2	(234)	1.14 min.	Beta
92	Uranium II	(234)	1,000,000 yrs.	Alpha
90	Ionium	(230)	76,000 yrs.	Alpha
88	Radium	225.97	1600 yrs.	Alpha
86	Radon	(222)	3.82 days	Alpha
84	Radium A	(218)	3.05 min.	Alpha
82	Radium B	(214)	26.8 min.	Beta
83	Radium C	(214)	19.7 min.	Beta
84	Radium C′	(214)	very short life	Alpha
82	Radium D	(210)	25 yrs.	Beta
83	Radium E	(210)	5 days	Beta
84	Polonium	(210)	136.3 days	Alpha
82	Radium G	206.05	Stable end product	Radium Lead

The accompanying table indicates that uranium is the parent of a whole series of radioactive substances of which radium is perhaps the most important. These substances are continually disin-

tegrating, their activity gradually diminishing, so that after a lapse of time they will disappear. In the case of radium its activity will be only one-half as great at the end of 1600 years. This is called the half value period. The product resulting from the break up of the atom of radium is an atom of helium and an atom of radon whose half value period is only 3.82 days. Thorium is also the parent of a radioactive series.

TABLE III.

Radioactive Series from Thorium.

Atomic No.	*Element*	*Atomic Weight*	*Decays to ½ value*	*Rays Emitted*
90	Thorium	232.12	16,500,000,000 yrs.	Alpha
88	Mesothorium I	(228)	6.7 yrs.	Beta
89	Mesothorium II	(228)	6.13 hrs.	Beta
90	Radiothorium	(228)	1.90 yrs.	Alpha
88	Thorium X	(224)	3.64 days	Alpha
86	Thoron	(220)	54.5 sec.	Alpha
84	Thorium A	(216)	0.145 sec.	Alpha
82	Thorium B	(212)	10.6 hrs.	Beta
83	Thorium C	(212)	60.5 min.	Beta
84	Thorium C′	(212)	very short life	Alpha
82	Thorium D	207.77	Stable end product Thorium lead	

The number of atoms which will break up per second is proportional the number of atoms present and is also different for each kind of atom. At the end of a time T only one-half of the atoms will remain while at the end of a time 2T only one-half of these or one-quarter of the original number will have resisted disintegration. The decay of radioactive substance is independent of the external conditions of temperature or pressure and it appears to be impossible for man to alter it in any manner. It is a constant of nature and as such enables us to determine the age of the rocks containing the radioactive material. The end product of the disintegration of the uranium atom is an atom of radium-lead having the properties of ordinary lead but with a slightly different atomic weight. Elements having the same properties and the same atomic number but different in atomic weight are known as isotopes. The uranium atom of atomic weight 238 has given off 8 alpha particles or helium atoms of atomic

weight 4 and has been reduced to an atom of lead of atomic weight 206. The expulsion of an alpha particle reduces the atomic weight by 4 and the atomic number by 2 while the removal of a beta particle increases the nuclear positive charge and the atomic number is increased by one.

AGE OF THE ROCKS

The life of the uranium atom is very great, only about 1 in 100 million atoms disintegrating per year. For every gram of uranium present only 1 ten-billionth of a gram of radium lead will be produced in one year. Let us consider a mineral which contains 2 hundredths of a gram of radium lead for every gram of uranium. We can determine its age by dividing the 2 hundredths of a gram of radium lead by the 1 ten billionth of a gram which will be produced in one year and find the rock to be about 200 million years old. The oldest rocks so measured appear to be about a billion and a half years old. The mineral Thoranite from the island of Ceylon has an age of 400 million years while the Carnotite from Montrose County, Colorado, is only 29 million years old.

These radioactive rocks have been radiating energy ever since their formation in the crust of the earth. The air is more or less radioactive, as is also the water of many springs, depending upon the nearness of radioactive material.

Shall we drink radioactive water and be rejuvenated?

Special apparatus for radiating the water may be purchased at a good price or you may merely place in your water cooler a mass of radioactive material and draw off the water in the usual manner. In fact, some persons advocate the radium bath if one would gain Vigor, Vim and Pep. I shall refrain, however, from making any comments upon this phase of the subject.

What is the effect of radioactivity upon plant and animal life? Experiments have indicated that small quantities of these radiations may stimulate growth while larger quantities prove detrimental. It has been shown that X-rays, acting upon the germ cells, have produced some very peculiar variations in different types of animal life. Could it be possible, since the gamma rays are very similar to the X-rays, that the great variety of life upon this planet might be due to the action of the rays from radioactive ores in the crust of the earth?

RADIOACTIVE ORES

The distribution of radioactive material is widespread but only in a very few places has it been found in sufficient concentration to pay to mine the ore. The initial source of radium was obtained from the uraninite ore found in Bohemia. It was from large quantities of this ore that Madame Curie obtained the first radium. Until 1922 the greater part of the world supply of radium was produced in this country from the carnotite ores found in Colorado and Utah. Most of these mines have discontinued, although I have been able to obtain carnotite ore from the Yellow Circle Mining Company of Moab, Utah, containing varying amounts of uranium oxide.

The reason for the closing of the mines was the discovery in the Belgium Congo of deposits of pitchblende containing twenty times as much radium as the carnotite ore from Colorado. This gave the Belgians a monopoly in the production of radium which they still continue to hold. It is a long and difficult process to extract the radium from the ore and it is usually obtained as the chloride or the bromide of radium at a cost to the consumer of about $65,000 per gram. During the last three years, ending November, 1930, the United States has purchased from the Belgians about $1,500,000 worth of radium, or about 34 grams. The total world production of radium is not much in excess of 350 grams.

Radioactive deposits have been found in Philadelphia, but in very small quantities. The Mineralogical Society of Philadelphia reports the finding of specimens of radioactive ores, such as autunite, along the banks of the Schuylkill River in Fairmount Park and at several quarries in Germantown. This is sufficient to make the waters of the Wissahickon and the Schuylkill River slightly radioactive.

OF WHAT USE IS IT?

This is the question many always ask when a scientist in his search for truth makes a new discovery. The applications are usually twenty years behind the discovery. It has been thirty-five years since the discovery of radioactivity and a number of uses have been found. I have already mentioned its use in the production of luminous paint. Large quantities were used during the World War for illuminating compasses, gunsights, airplane and submarine dials.

RADIUM THERAPY

In the field of medicine we use perhaps the greatest amount of radium. The rays given off by radium appear to have a selective action upon the diseased cells producing very little disturbance to the normal tissue. It has been my privilege to visit the radiological department of several of the hospitals in Philadelphia and learn at first hand what is being accomplished in the treatment of disease, especially cancer, by the application of radium.

In many instances it is not radium that is used, but radon, the radioactive gas which is produced when an atom of radium disintegrates with the expulsion of an alpha particle. Several grams of radium salt in solution are kept in a fireproof safe and by suitable pumps the radon gas is drawn off each day, purified and sealed in glass or gold tubes for use in the treatment of disease. From Table II of the radioactive series of elements derived from uranium we can see that radon has an atomic weight of 222, is also radioactive and disintegrates very rapidly, having a half value period of less than four days.

These minute glass tubes, called seeds, containing the radon are implanted, in many cases, in the cancerous tissue by the use of a hollow needle through which the seeds are forced. The radiation from the radon within the seeds appears to have a therapeutic effect upon the diseased tissue which it penetrates. The radiation rapidly decays and the glass seeds are left in the tissue without serious effect. In other cases the tubes filled with radon are placed in metal containers and introduced for varying lengths of time into the cavities of the body or applied to the surface of the skin under treatment. The metal containers absorb the alpha rays and the less penetrating beta rays permitting only the hard beta and the gamma rays to act upon the tissue.

All radon tubes must be handled with extreme care so as not to affect the attending nurses and physicians. Careful records must be kept concerning the strength of the radiation used and the time of exposure. Only in this way can the treatment be controlled and then only in the hands of an experienced doctor. Excellent results have been obtained in the treatment of certain forms of skin diseases and cancer. So-called birthmarks have been successfully removed by the application of radium. Cancers of the lip and mouth have responded to radium treatment with cures amounting to about 65 per cent. of the cases treated. The average for all cases treated is, however, only about 35 per cent., but when we consider that cancer is increasing in almost every civilized country, the importance of the radium treatment

is evident. About three-quarters of a million people in the United States suffer from cancer which might be treated if the radium was made available.

The use of radium is still in the experimental stage. No definite procedure appears to be employed as to the amount of radium element to be used or the time of exposure. Different hospitals are using widely different methods of treatment of disease because of very different concepts regarding the action of the radiation upon the cell structure. In some hospitals enough radium is used to burn out the diseased tissue while at others where burning is not considered desirable a very much smaller dosage is applied. The living cell behaves like a small electric battery with positive and negative charges neutralized. In the case of cancer cells the electrical property has been disturbed and it is hoped that by shooting very small quantities of beta rays or negative electrons into the cell that the tissue may be caused to return to the normal condition.

Thousands of cases are being treated and many cures reported. Has the discovery of radioactivity by Becquerel and the Curies been of any use?

SUMMARY

In conclusion let me repeat that many of the heavier, more complicated atoms are disintegrating with the expulsion of alpha, beta and gamma rays. The alpha particle is a charged helium atom, the beta particle is a negative electron, and the gamma ray is a light ray similar to the X-ray of very short wave length.

The effect of the expulsion of an alpha particle from an atom causes a change in the atomic weight of the resulting atom of 4 and a shift of the atomic number in the periodic table by 2. With the expulsion of a beta particle or negative electron the positive charge on the nucleus is increased by 1 and the resulting element has an atomic number greater by 1, no change in the atomic weight being produced. The series of the radioactive changes upon the elements uranium (92) and thorium (90) results in the end product lead (82).

The radiations from the radioactive elements affect the photographic plate, discharge electrified bodies, produce luminescence, and have a therapeutic value in certain diseases.

Disintegration of the elements of high atomic weight appears to be a natural process and cannot be altered by man.

WHAT IS GAS?*

By Freeman P. Stroup, Ph. M.

Professor of General Chemistry, Philadelphia College of Pharmacy and Science

FOR the tenth consecutive year your speaker comes before you this evening to attempt to interpret certain phenomena of everyday life in chemical terms.

Freeman P. Stroup, Ph. M.

The theologian interprets God in the thoughts of men; the chemist interprets the facts of God's created things and formulates generalizations (he calls them "laws") concerning them, though he does not always use his knowledge to show the Creator's connection with the facts. Some even try to prove the non-existence of a Supreme Power by the facts of the universe.

Like the preacher, the lecturer on scientific subjects is apt to have certain things which he emphasizes more than others; so, if some of the hearers notice in tonight's lecture repetitions of some things given by the present speaker in previous lectures, it is because he feels the necessity of repeating them, in order that some person or persons may be put on their guard against certain dangers that confront us in the use of gas and gasoline, particularly, the ignorance of which is responsible for the untimely deaths of numbers of persons every week, particularly in the winter months.

DEFINITIONS

The subject for discussion tonight is, "What Is Gas?" Let us consult a dictionary.

"Gas—a word invented by the chemist von Helmont, of Brussels, and first given by him to carbon dioxide, a 'spirit' obtained on burning charcoal. (*Geist*—ghost.)"

1. "An aeriform fluid:—applied to any substance in the elastic or aeriform state."

*One of a Series of Popular Science Talks given at the Philadelphia College of Pharmacy and Science, 1931 Season.

2. "Specifically, in popular usage, (a) the common gas used for illuminating purposes, a complex mixture of gases; (b) Laughing gas; (c) any irrespirable aeriform fluid."

Now let us see what "aeriform" means:

"AERIFORM—Having the form or nature of air, gaseous."

Next let us see what "air" is:

AIR—"Formerly any aeriform body, a gas; now, the fluid which we breathe, and which surrounds the earth; the atmosphere."

And now:

ATMOSPHERE—"The whole mass of aeriform fluid surrounding the earth."

If you can imagine some person not knowing the meaning of any of the words, GAS, AERIFORM, AIR, or ATMOSPHERE, tell me how much help could he get from this particular dictionary? Probably all present this evening know the meanings of all four terms. All, too, are cognizant of the fact that all matter can be classed in one or another of three groups—solid, liquids, or gases—according as their particles (a) held fast to one another, (b) move freely over one another, or (c) tend to repel one another. A solid needs no container; a liquid needs a container with sides and bottom; a gas needs a container with sides, bottom and top, and always fills the container. Solids and liquids are visible. Except when colored, gases are practically invisible. Gases contract greatly under the influence of pressure, and eventually liquefy when the pressure becomes great enough. Easily liquefied gases are frequently called "vapors."

Some of my hearers may not be familiar with chemical terms, hence a few explanations may be in order.

All matter, whether solid, liquid or gaseous, is composed of particles of one of 92 kinds of simple matter each known as a so-called "element," or, more generally, of particles made up of compounds of two or more of these elements.

PURE AIR

For instance: air is a *mixture* chiefly of the elements oxygen and nitrogen, while water is a *compound* of the elements oxygen and hydrogen. *Mixtures* may vary as to the proportions of the several elements composing them, but *compounds* are always definite as to proportions of their constituent elements. In pure air the proportions by weight are approximately 56 of nitrogen

to 16 of oxygen; in a closed room occupied by a number of persons or animals the air may be considerably poorer in oxygen, and this is also the case in a room in which a fire of any kind is burning, either in a stove or a lamp.

Water, on the other hand, is always composed of 2.016 parts by weight of hydrogen to each 16 parts of oxygen. Whenever hydrogen or any compound of hydrogen burns in air or oxygen, the hydrogen combines with oxygen in the proportions given, and water is always the product of the combustion.

The combining weights of elements have been compared with those of hydrogen as 1.008, or oxygen as 16.00, and are then known as "atomic weights." From the results of the analyses of compounds and a study of the atomic weights of their constituent elements chemists have evolved so-called "formulas" for each. For example, methane contains 12 parts of carbon to each 4 parts of hydrogen; the atomic weight of carbon is 12, and of hydrogen is 1 (disregarding the slight fraction .008); and we say then that methane has the formula CH_4, in which C represents the 12 parts of carbon and the H_4 the 4 parts of hydrogen.

Methane burns in air to form two substances—carbon dioxide with the formula CO_2 and hydrogen monoxide (water) with the formula H_2O. The chemist pictures this in the form of the "equation": $CH_4 + (O_2)_2 = CO_2 + 2H_2O$.

Mathematically, this means that 16 parts by weight of methane combine with $2 \times 2 \times 16$ (64) parts of oxygen to form $12 + (2 \times 16)$ (44) parts of carbon dioxide and $2 \times (2 + 16)$ (36) parts of hydrogen monoxide. $16 + 64 = 44 + 36$.

If the methane and oxygen are mixed in the proportions indicated (1 volume of methane and 2 volumes of oxygen), and the mixture ignited, a great deal of heat is evolved and the products of the reaction, both gaseous, are greatly expanded and an explosion results. This is what happens in coal mines occasionally. If the reaction takes place in apparatus which does not permit of the escape of the products, the volume of the gases produced will be the same as the original (1 volume of CO_2 and 2 volumes of H_2O), provided that the temperature at time of both measurements (before ignition and after) are the same, and above 100 degrees Centigrade (212 degrees Fahrenheit), the boiling point of water.

Like many another word found in all good dictionaries and very properly defined there, the word "gas" has, in our everyday language, many different meanings—some of them rather far removed from any of the dictionary definitions—and unless one notes carefully the connection with other terms he may not have any very clear idea of the meaning of the word in many cases. It is much like the explanation some wag gave of the Einstein Theory of Relativity—"You cannot tell where you are unless you know what time it is, and you cannot know what time it is unless you know where you are."

The average person can enjoy a stage production or a screen picture best when there is something of a plot—even a very thin one—to be followed. It is my purpose to tell you this evening of some of the uses of the word "gas" in our everyday "patter," and to do this most effectively I shall try to tell it in the form of story, following out the idea suggested in the postcard and booklet announcements of this lecture. Here goes.

A GAS TREATISE

Mr. A. Citizen, like most of us at sometime in our lives, has been suffering from a form of indigestion in which his stomach has been distended with "gas," causing a sense of pain and fullness which is relieved to a considerable extent when he "belches" or "rifts." What and why is the gas? Doctors disagree. "Who shall decide when doctors disagree?" The lecturer has been assured by one rather eminent doctor that it is nothing but air swallowed with food or drink, or both,—the air expanding under the influence of the heat of the stomach. But we are not convinced, for we cannot believe that we swallow more air when we eat sauer kraut or other cabbage dishes than when we eat meat and potatoes. If it is due to air, why do we not have trouble after eating light breads and spongy cakes, which are full of air (or CO_2). "Angel food" cake is full of air and we do not recall ever having had "tummy ache" after indulging in this delectable product of the baker's art. Mr. Citizen has not slept well and is grouchy in the morning. Do not blame him too much.

FUEL GASES

Mrs. Citizen is preparing breakfast—broiling the meat, frying the potatoes, baking the cakes, "over the gas" in her up-to-date gas range, while "the mister" is "toasting his shins" before a fire in a "gas grate" in the library, while he gives the Morning Astonisher "the once over." If their home is in the western

part of Pennsylvania, Eastern Ohio, West Virginia, anyone of a number of mid-continent states, Texas, certain parts of Colorado, or some of the Pacific Coast states, the chances are that the gas they are using is socalled "natural gas." If so, it is obtained from drilled wells ranging in depth from a few hundred feet to five thousand or more, and piped from the wells to the point of consumption, which may be several hundred miles distant. There is a record of its having been piped a thousand miles in 1930, and there has been considerable talk of bringing it to this city (Philadelphia) from west of the Allegheny Mountains.

NATURAL GAS

Natural gas has been known for a long time, but only within a comparatively few years has its value as a fuel been realized. It is often produced from the same wells which yield petroleum, and cases have been known where the operator of oil wells had coal hauled from considerable distances for use as fuel under his steam boilers while the gas from his wells was allowed to burn as a big torch outside the boiler house. Fredonia, N. Y., is said to be the first American community to use it as an illuminant on the streets.

Chemically, natural gas is a mixture of compounds of hydrogen and carbon (so-called "hydrocarbons"). Methane, CH_4, is the chief constituent, with varying proportions of ethane, C_2H_6, propane, C_3H_8, and butanes, C_4H_{10}. A so-called "dry gas" contains practically only methane, while a "wet gas" contains higher hydrocarbons (butanes, C_4H_{10}, pentanes, C_5H_{12}, etc.). Nowadays "wet gas" is usually treated by compression or absorption methods to remove the higher hydrocarbons which are then sold as so-called "casing-head gasoline" to be blended with less volatile petroleum fractions to be used as motor fuels.

Natural gas is an excellent fuel and, when burned with the mantle type of burner, gives a very satisfactory source of light. In its combustion it produces large quantities of water vapor, hence gas stoves in which it is used as fuel should be provided with good flues to carry off the products of combustion, and rooms lighted with this gas should be well ventilated—unless one has a predilection for atmospheres resembling those of Turkish-bath establishments. Leaks in natural gas service pipes are not a serious menace to the health of persons inhabiting quarters where they may occur, as the gas is non-

poisonous. In heavy concentrations it may act as an asphyxiant, while in smaller amounts it is somewhat intoxicating.

The natural gas from some localities, notably certain "fields" in Colorado and Texas, contains considerable helium. In 1930 there was completed in Southeast Colorado a well the gas from which contained 7 per cent. of helium. Numbers of other "fields" yield gas containing helium but not in sufficient quantities to make its separation practicable. The process usually used is one by which under heavy pressures the hydrocarbons are all liquefied while the helium remains gaseous. When the separated liquid is allowed to come back to near normal pressure the gaseous form ensues. Probably all of you know that, next to hydrogen, helium is the lightest substance known, hence its use for balloon filling. It has the other valuable property of being non-inflammable.

But we do not have to live in or near natural gas supplies to reap some of the benefits accruing from its utilization, for the finest grade of lampblack known is made by a partial combustion of this gas, and lampblack is the pigment of printers' ink. Whenever you read from a page of your favorite magazine or book, you are under deep obligations to natural gas. And now they are making certain alcohols (not the kind that some people profess to like to drink) from some varieties of this gas, which alcohols are very useful as solvents in many industries.

COAL GAS

If Mr. and Mrs. Citizen live in Philadelphia, New York, Boston, or any one of a lot of smaller eastern cities the "gas" they are using is "artificial gas," and may vary in composition to a very considerable extent. Nearly 250 years it was known in Europe that when bituminous coal was heated in suitable retorts a combustible gas was evolved, but there is no record that any practical use was made of the gas. In 1785 an Englishman used it to light a lecture room; in 1802 an English factory was lighted by it; in 1809 a London street was illuminated with it, and by 1816 it was generally used as a street illuminant in London. Of course, other municipalities adopted it, and until about 50 years ago it was about the only "gas" used for either fuel or light, and chiefly for the latter purpose. The average composition of this "coal gas" by volume is methane 40 per cent., hydrogen 40 per cent., other hydrocarbons and carbon monoxide 20 per cent.

Those of us who have seen 50 or more winters and a corresponding number of summers recall the gaslights of the railway cars of 25 or more years ago. The gas used in them was made by superheating certain petroleum fractions under pressure, and thereby breaking down ("cracking") the higher (liquid) hydrocarbons into simple (gaseous) hydrocarbons. This gas was sometimes known as "oil gas," sometimes as "Pintsch gas" (from the discoverer of the process of manufacture). The gas supplied to Philadelphia and other eastern cities some years ago was in part "oil gas." It furnished the so-called "illuminants" in the days when the "candlepower" of a gas was an important item—the days of the fish-tail type of burner, before the advent of the mantle-type (Welsbach).

WATER GAS

Another variety of artificial gas is so-called "water gas," manufactured by bringing coke to a high stage of incandescence by means of a blast of air, and then introducing steam. The coke which, chemically, is carbon, reacts with the steam (hydrogen monoxide) to form a mixture of approximately equal parts by volume of the gases carbon monoxide and hydrogen. The equation expressing the reaction is $C + H_2O = CO + H_2$. This gas is an excellent fuel but no good as an illuminant with the old-style "gas-jet." With the mantle-type burner it produces a good light. Many of our city supplies contain this gas in admixture with "coal gas" and "oil gas."

Carbon monoxide is a very poisonous substance, and this fact accounts for the great number of serious illnesses and fatalities caused by accidental, as well as intentional, inhalations of city gas in this and other eastern municipalities. The first propositions to mix "water gas" with "coal gas" for use as an illuminating gas were met by much opposition on the part of those who had visions of a "wholesale slaughter of innocents," because of defective pipes and fixtures in homes. While carbon monoxide is odorless (and thus incapable of giving warning of its presence) other constituents of city gas are far from odorless, and so people are easily warned when gas escapes.

PRODUCER GAS

Somewhat akin to "water gas" is what has been called "producer gas," used in industries where gaseous fuel is almost if not altogether a necessity. It is made by blowing air through large quantities of ignited anthracite or coke. The gas produced is a mixture chiefly of nitrogen (from

the air and not combustible) and carbon monoxide (which is the valuable combustible). The mixture is generally conducted direct from the generator to the fire chamber, sometimes through superheaters. It is used particularly in glass furnaces, certain types of steel furnaces, and in cement burners.

It may just be that Mr. and Mrs. Citizen are living where there is no public gas supply, but they may still have the conveniences of gas fires, for today there may be obtained from certain sources liquefied propane and butanes in drums under pressure, which, when connected with suitable piping to the gas range may be used just as simply and effectively as any other gas. This gas has about the same heating value as that of natural gas—somewhat greater than that of a "dry gas" and not quite as great as that of a "wet gas," and is better than the average city gas.

As your speaker was preparing the notes for this talk he heard an ominious rattling in the basement of his lodging house, transmitted to him through the hot-air pipes. This was his notification that the fires were being banked for the night. He soon had another warning, also through the hot-air pipes, but one this time made apparent through his nose, for the all-too-familiar odor of hot-air heated houses ("coal gas") soon assailed him. This form of gas is produced when cold coal is covered over a mass of glowing coals, particularly if the coal contains sulphur compounds, as most coal does. Sometimes the sulphur is converted into hydrogen sulphide (particularly if the coal is wet) with odor of rotten eggs, but generally it is concerted into sulphur dioxide with the odor and choking effect on the throat of burning sulphur. Unless the coal is particularly rich in sulphur no great harm is apt to result, but the same conditions which bring about the production of these gases might bring about the formation of considerable quantities of carbon monoxide, with disastrous results to occupants of rooms into which the "coal gas" may be delivered. Hot-air heating systems have many things to be said in their favor, but they need to be carefully watched and kept in repair, lest they prove a menace to health or even life itself. Numerous fatalities have resulted from products of combustion of fuel in the furnace part of the system getting into the air circulation system instead of going up the flue to the out-of-doors. This may come about because of leaks in the walls that separate the fire-box system from the air system, or it may come about through the operator of the furnace closing the damper in the smoke-pipe,

thus driving the fire gases out into the basement or other room in which the furnace may be located, in which case they can easily be drawn into the air system, especially if the air supply is drawn from the same room instead of from the out-of-doors. One of the most prominent pharmacists in this country lost his life a few years ago through going into the cellar of his home after having banked the fires for the night. Gases which should have gone up the chimney had backed into the cellar.

We left the "Mister" in the library reading the newspaper. Looking over his shoulder we see headlines: "Big Gas Well in Oklahoma," "Many Killed in Gas Explosion in Coal Mine in Pennsylvania," "Man-hole Cover Thrown High in Air by Explosion of Sewer Gas," "Prominent Business Man Killed by Gas in His Garage," "Wayfarer Found Dead Beside Lime-kiln, Victim of Gas," "Five Boys Killed by Gas in Abandoned Colliery," "Two Boys Lose Lives in Empty Silo by Gas." Over on the advertising pages we read: "Pep Up Your Auto by the Good Gas," "Stop That Knock by Using Ethyl Gas," "Painless Extraction of Teeth, Nitrous Oxide Gas Administered," "Gas on the Stomach Relieved by Use of Bunko's Pills."

At this point the lady of the house hails the "master" (so-called) with "Come to breakfast, John." The "Mister" comments on the many references to "gas" in the morning paper, and this reminds the "Missus" that a booklet, and later a postcard, had come to the house, both announcing a lecture to be given that very evening at the Philadelphia College of Pharmacy and Science on the subject, "What is Gas"; and then and there they decide to "cut prayer-meeting" (it was Wednesday evening) and take in the lecture instead. Here they are and we shall proceed.

First: The big gas well in Oklahoma is only one of hundreds that have been drilled in the last fifty years. Individual wells have yielded millions of cubic feet of gas in each 24 hours, with pressures up to a thousand pounds per square inch. The chemical composition of natural gas has already been stated. The value of it to certain industries has run into many millions of dollars, and the value and convenience attending its use as a domestic fuel has been incalculable. Believe it or not, Pittsburgh has not always had reason to be called "The Smoky City." For a number of years in its history natural gas

was the chief fuel used there, and the city was as clean as any other large city, not excluding those which were not manufacturing centers.

Second: As to the explosion in the coal mine, it was only one of many such. Many mines, especially in the soft coal districts, are "gassy," *i. e.*, they contain, unless kept well ventilated, considerable quantities of methane, CH_4, given off by the coal. When the quantity in the atmosphere of any particular gallery equals one volume to from 6 to 14 volumes of air, the mixture is almost certain to explode if a spark or flame comes into contact with it, and the mixture is then known to the miner as "fire-damp." An open flame, such as that from an unprotected miner's lamp, or from a lighted match struck to light the miner's pipe, or even a spark from a steel pick striking a stone, is quite sufficient to ignite the mixture. The mixture of gases in the mine after the explosion is variously known as "after-damp," "choke-damp" or "black-damp." It varies in chemical composition according to the original proportions of methane and air. Most of it is nitrogen (non-supporter of life) from the air, the balance of it is: (a) carbon dioxide (an asphyxiant), if the original proportions of methane and air were 1 to 10 by volume; (b) carbon monoxide (a rank poison) and carbon monoxide if the proportions of methane to air were 1 to less than 10; (c) carbon dioxide and oxygen (the life-supporter of air) if the proportions of methane and air were 1 to more than 10. The miner not killed by the explosion would be promptly asphyxiated under conditions (a) and (b), but would have a fighting chance of being rescued alive under condition (c), particularly if the proportions of methane and air were at or near 1 to 14.

Third: The sewer-gas explosion. Sewer gas is apt to be a very variable mixture, depending upon the methods of its formation. Some kinds of organic matter collecting in parts of sewers where there is not a strong water flow may undergo fermentations with the formation of inflammable gases; acids from certain manufacturing plants may meet other compounds from other plants and react to form inflammable gases; workers in dry-cleaning establishments and other industrial plants have been known to run waste gasoline into the sewer. Occasionally a mixture of such inflammable gas and air collects under the cover of a manhole, and less occasionally the mixture is ignited and the cover sent hurtling through a considerable distance. Sewer-gas explosions are rare, but that fact does not make this

gas any less a menace to humanity. The poisonous character of a great deal of it makes it a source of danger, happily capable of being guarded against by proper "trapping" of drain pipes.

Fourth: "Deadly monoxide gas." Despite the frequency with which the eyes of newspaper readers are greeted in these days, particularly in winter, with accounts of fatalities caused by the inhalation of exhaust gases from automobiles, there are still many people who seem to be utterly unaware of the danger there is in the running of auto motors in confined spaces. When the motor runs out-of-doors the exhaust gases are chiefly carbon dioxide, nitrogen and steam, but probably contain a few per cent. of carbon monoxide. When the motor runs in a confined space, as in a closed garage, the oxygen of the air is soon decidedly depleted and the rate of production of carbon monoxide is rapidly increased, so, that in a very few minutes there may be enough of the carbon monoxide in the atmosphere of the room to put any living occupants of the room "hors de combat," and that, too, without any warning. Just a few minutes before this last paragraph was written the author read in the evening paper of a young lady starting the motor of her husband's car in the basement garage and letting it run to charge the batteries, while she went upstairs to take a nap. The exhaust gases found their way upstairs and she never awakened. Do not allow your motor to run, even for a minute, in your garage, unless the doors are open.

Fifth: The gas from the limekiln. A simple form of limekiln often used by farmers to make lime to be used about the farm is a crude form of furnace built into the side of a hill. A lot of fuel (coal or wood) is piled up on the floor and covered with pieces of limestone, and the fuel ignited, the operator going about other business. He may not know just what chemical reactions are taking place in the kiln. The chemist writes it thus:

$$\underset{\text{(Calcium Carbonate)}}{CaCO_3} + \underset{\text{(Heat)}}{\Delta} = \underset{\substack{\text{(Calcium Oxide)}\\ \text{(Lime)}}}{CaO} + \underset{\text{(Carbon Dioxide)}}{CO_2}$$

The day passes and in the cool of the evening along comes a weary traveler who welcomes a chance to sleep alongside the furnace, but during the night the wind dies away and the carbon dioxide, being heavier than air, settles about him. The next morning the "coroner sits on the case." Carbon dioxide, by the way, is the substance which

in the solid form is being used a great deal today by ice-cream makers and vendors under the name of "dry ice," "carbice," etc. It produces a lower degree of temperature than ice, or ice and salt, and does not liquefy. We know of no cases of harm coming from its use, probably because the gas formed from it is so much heavier than air that it has a tendency to sink to the floor level and not rise to the levels where the heads of persons working with it are apt to be. It would seem wise to keep the baby off the floor of a room in which it was being handled. Of course, most everybody knows that carbon dioxide is the substance which gives the "fizz" to all carbonated beverages.

Sixth: The boys in the abandoned colliery. This is based on an item that appeared in the papers recently. The speaker does not know what the final verdict was as to the cause of death, but it might have been one of several. The gas might have been ordinary mine gas (methane), but it is more likely to have been carbon dioxide from decaying organic matter, or from the decomposition of calcium bicarbonate in the water in the mine.

Seventh: The boys in the empty silo. A few years ago the newspapers told of an unusual gas fatality. Some boys were playing on the roof of a silo which was apparently empty (there was no ensilage in it), and one of the boys dropped a shoe through the open hatchway. One of them descended a ladder to retrieve the shoe but was overcome as he neared the floor. Another followed, only to topple over also. Others spread an alarm and workers opened the door at the bottom, but the boys were past help. One of the rescuers was overcome before the bodies were gotten out, but speedily revived when brought out into fresh air. The "gas" in this case was undoubtedly carbon dioxide, produced in this case from the fermentation of the ensilage-making material in an adjoining silo connected with the empty one by a small tunnel. Decaying leaves and other vegetable matter in the bottoms of dug wells may form the same gas, so no one should descend into a well without first testing the atmosphere in it by lowering a lighted candle or lantern into it. If the flame is extinguished, stay out until after the dangerous gas has been bailed out, which may be done by means of a bucket (or open umbrella, if the well is large enough in diameter), much as one would bail water out of any cistern.

Eighth: Auto "gas." Thus far we have been speaking of substances which are in the gaseous form at ordinary temperatures, but when we speak of "gas" in connection with the automobile we generally mean gasoline or other motor fuels purchased in liquid form. Whether the term "gas" here used is the result of the average American's tendency to abbreviate terms, and is the abbreviation of the word "gasoline," or whether it is used because the fuel is converted into the gaseous form before being burned in the cylinder of the motor, the speaker knows not. The first suggestion is likely the true one.

Originally the name "gasoline" (also spelled "gasolene") was given to a mixture of hydrocarbons chiefly of the Marsh gas series, mostly butanes, pentanes and hexanes. These were obtained in the fractional distillation of petroleum, being the portion that distilled over just before the kerosene fractions were obtained. A little of it was used as a solvent for fats, etc., some of it was used to produce a gas for illuminating purposes in more or less isolated places, like summer resort hotels, etc., in which case the vapor was mixed with some air, not enough, however, to form an explosive mixture. There was not much of a market for it, and the petroleum refiners did not take any special precautions to keep it from evaporating, as they do now. Unscrupulous refiners of petroleum made their "cuts" in the distillation process so as to leave some of it in the kerosene fraction, which, of course, made the kerosene dangerous. Because of this practice it was found necessary for the various states to draft legislation establishing "flash tests" and "fire tests" which had to be met by burning oils sold within the confines of the particular state.

The advent of the internal combustion engine changed all this. The gasoline, which previously had been more or less of a nuisance to the oil refiner, now became the most valuable of the products of the refining of petroleum, the owners began to guard against its evaporation, and, instead of leaving gasoline in the kerosene, the practice is not uncommon of leaving kerosene fractions in the gasoline. A great many processes have been patented the purposes of which have been to increase the yield of gasoline, and it is now claimed that a process has been perfected whereby a hundred barrels of crude petrolum can be converted into an equal number of barrels of good motor fuel.

Gasoline varies in composition, dependent upon the kind of petroleum used in its manufacture, and the nature of the process used in its manufacture, but it is essentially a mixture of hydrocarbons of

low to relatively low boiling points. Time was when it was a mixture chiefly of saturated hydrocarbons, but there are numerous gasolines today which contain considerable quantities of hydrocarbons of other series, both cyclic and acyclic. It would be entirely possible to have a hundred samples apparently alike and yet have no two of just the same chemical composition, and that, too, when produced by the same manufacturer. This explains why different lots of the same commercial brand do not always behave in just the same way, and also explains why some drivers can get better results from one brand than from another. There is not likely to be as much variation between different lots of the same brand as between different lots of different brands. The indications, however, are that soon there will be a very much higher degree of uniformity between different lots of a given manufacturer's product.

Ninth: "Ethyl gas" is the name given to motor fuel containing a small amount of a substance known to the chemist as tetraethyl lead $(C_2H_5)4Pb$, which causes a smoother running of the motor, decreasing so-called "knocking." Gasoline containing this substance should not be used for cleaning clothing, or for any other purpose by which it may come into contact with any part of the body of the person using it. The anti-knock effect is capable of being brought about by the use of a number of other substances. It is claimed that certain unsaturated hydrocarbons have this effect.

Tenth: When the dentist talks of "gas" he usually has reference to nitrogen monoxide, N_2O, one of five well-known oxides of nitrogen, differing quite widely in their properties, and particularly in their physiological action. This particular oxide has been largely used for producing a fleeting form of anesthesia, such as would be desirable in the extraction of a few teeth. It is colorless with a sweetish odor. When the patient is only partly under its influence he (or she) sometimes becomes more or less hysterical and indulges in immoderate laughter (hence a common name for the gas, "laughing gas"), or, sometimes, weeping or cussing. If dentists "told tales out of school" some of us might appear in different light than we do in the presence of our friends. It is often called "nitrous oxide gas," but this is a misnomer. The real nitrous oxide is a red gas and its inhalation brings about a condition that is anything but a *laughing* matter.

WAR "GASES"

Those of us who were newspaper readers during the World War read a great deal and heard a great deal about "gas warfare," "gas attacks," soldiers "gassed," "mustard gas," "tear gas," and many others. Here, as in the instances already given, the word "gas" meant many different things. One of the first gases used was chlorine, a heavy, greenish-yellow, suffocating, corrosive gas which proved very effective in putting soldiers to rout. A kindred substance, bromine, was also somewhat used. Gas masks were soon devised that made these substances of none effect. Many liquids were used under the general name of "tear gas." They were usually thrown into the camp of the enemy in shells, being vaporized when the shell exploded. We heard a great deal of "mustard gas," and many people thought it to be volatile oil of mustard (allyl isothiocyanate C_2H_5NCS) but it was dichlorethyl sulphide ($C_2H_5Cl_2S$). Some of these substances are used today in the dispersion of mobs, and in the "smoking-out" of criminals from hiding places.

INDUSTRIAL GASES

A gas which plays very important roles in modern construction and destruction of steel frame structures is acetylene, C_2H_2, a rather evil-smelling gas generally made by the action of water on calcium carbide. When mixed with oxygen in the proper proportions at the tip of a burner it produces a very hot flame which easily "cuts" the hardest steel. Heavy beams, rails, etc., can be easily cut into smaller masses to permit of easy handling, holes can be burned through plates much more quickly than with the old drill method, welding can be done by the experienced operator without dismantling machinery (in case of breaks). A solution of this gas in acetone constituted the prestolite used for automobile lights a generation ago, producing a brilliant white light.

BAKING AND BEVERAGE GASES

The "gas" which causes bread to "rise," gives "lightness" to baking-powder biscuits, fluffiness to "soda-and-sour-milk" biscuits and cakes, gives the "fizz" to soda water and other carbonated beverages and to bromo-seltzer and other granular effervescent salts, is carbon dioxide. In the bread and other yeast-leavened products it is formed by the fermentative action of an enzyme in the yeast used upon certain sugars in the fermenting mass; in the baking-powder products it is formed by the action of an acid or acid-salt or some form of alum on sodium bicarbonate; in the soda-sour-milk products it is formed by the action of the acid in sour milk (chiefly lactic acid) on the soda (sodium

bicarbonate); in bromo-seltzer and other effervescent salts it is formed by the action of an acid or acid-salt on a bicarbonate (usually potassium bicarbonate). A great deal of this gas is produced in the manufacture of alcoholic liquors, again by the action of yeast on sugars. One large producer of industrial alcohol in this country is claimed to be more concerned with the recovery of the carbon dioxide produced in the plant than with the recovery of the alcohol.

BLEACHING "GAS"

To the bleacher of cotton, linen, paper pulp and other cellulose products "gas" means chlorine, which acts as an oxidizing agent on the colors in the unbleached material, oxidizing them to colorless compounds. Often he generates his own gas from chloride of lime (also called "bleach" and "bleaching powder") by the action of an acid on it; sometimes he produces it by action of electricity on a solution of salt; sometimes he just buys it in liquid form under pressure in cylinders or cars. Chlorine is largely used today in sterilizing municipal water supplies. To the bleacher of wool, silk, straw, sometimes flowers, "gas" often means sulphur dioxide, generally made by burning sulphur in a current of air.

GAS AND REFRIGERATION

In artificial refrigeration lingo "gas" may mean any one of a half dozen or more substances which are liquid at ordinary temperatures under rather moderate pressure, but vaporize at ordinary pressures. When the gaseous form is subjected to pressure the substance becomes warm, but if passed through cooling coils while under pressure the substance easily liquefies. If the liquid now be released from pressure it assumes the gaseous form, with the absorption of heat (production of cold) from the walls of its container. These operations constitute a cycle in every modern refrigeration system, whether commercial or domestic. Substances used include ammonia, NH_3, sulphur dioxide, SO_2, methyl chloride, CH_3Cl, ethylene oxide, C_2H_4O, and (recently) dichlor-difluor-methane, CCl_2F_2.

"GAS-FILLED" LAMPS

The first forms of electric-light bulbs used were of glass practically exhausted of air, and, consequently, bore a pressure of nearly 15 pounds on every square inch of their outside surfaces. Obviously, they could not be made very large. The present-day bulb is filled with some gas or gases which do not react with the substance of the filament, even at high

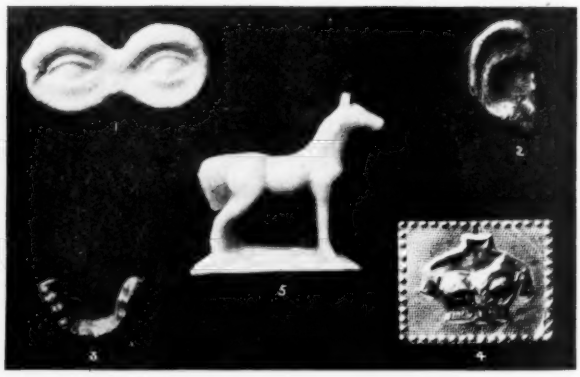
temperatures. The inside and outside pressures being practically equal, there would appear to be no limit to the sizes which might be made. The ordinary bulb is usually filled with nitrogen, but other gases are used in bulbs designed for special purposes. For very compact yet high-power lamps, to be used for such purposes as stereopticons, movie projectors, searchlights, etc., argon-filled bulbs have been found very effective. Neon is used as the filler in the alphabet tubes and other lighting tubes in the red advertising signs which are becoming so common. Other colors than red may be obtained by using other single gases or mixtures. So efficient is the modern gas-filled bulb that the arc light so largely used a generation ago for street and factory lighting is almost a thing of history only.

Mr. and Mrs. Citizen and the children have been very attentive listeners, and the children have apparently enjoyed the demonstrations, but we must not keep them here any longer as tomorrow is another school day. The subject has not been exhausted by any means, but we hope that something that has been said during the evening will have made such a deep impression upon the minds of our auditors that all of them will use the various forms of "gas" with which we seem to be hedged about with such intelligence that they will get the greatest possible benefit and none of the harmful effects from their use.

EX-VOTOS FROM BELGIUM

By Charles Whitebread*

THE presentation of votive offerings at certain shrines and in certain churches either to obtain the cure of a specific ailment or as a token of thanks for a cure which has been effected is a practice which can be traced to antiquity. Ex-votos are still employed quite commonly in European countries, and to a more limited extent by the people of some North and South American countries.



Ex-Votos From Belgium. (Courtesy of U. S. Nat. Museum.)

The ex-votos illustrated were collected in 1930 and 1931 at Louvain and Malines, Belgium, by Dr. Frans M. Olbrechts, Department of Ethnography, Royal Museum of Art and History, Brussels, and are now on exhibition in the magic medicine collection of the Division of Medicine, United States Naticnal Museum. The specimens numbered 1, 2, 3, and 4 are representations of the eyes, ear, teeth, and breasts, and are examples of the offerings presented for the cure of ailments affecting those parts of the human body. Specimen 5 is the type of ex-voto which would be offered for the cure of a horse. Ex-votos representing pigs, chickens, etc., are quite common.

Ex-votos are usually hung on an image, inclosed in a glass case, and kept carefully locked, the key being in the possession of one of the officials of the church. Another method of use, however, is to

*Phar. D., Assistant Curator, Division of Medicine, United States National Museum, Washington, D. C.

carry the ex-voto on the person. The time when the ex-voto is, so to speak, indicated is when the disease has entered on a phase of chronicity. Application is then made to the church official, and one or two ex-votos are procured according to the part affected, for which a receipt is given. When the patient gets well he must carry the ex-voto which has cured him back to the church, to which he must present a similar ex-voto he has had made for the purpose. European ex-votos are generally made of silver, but there are others of lesser and greater value. In the course of time the number of ex-votos increases to such an extent as to mask completely the supporting image. Then the church feels it necessary to relieve the situation by removing a good many of them. The ex-votos removed are weighed and sent to the jeweler to be melted and converted into other objects such as crosses, goblets, chalices, etc. The ex-votos show no artistic merit in design or execution. They are usually made in the likeness of primitive models from which form it is deemed wrong to depart.

The mode of use of ex-votos carried on the person is as follows: In eye diseases an artificial eye is hung on the right or left side; for stammering and lingual paralysis a tongue is suspended from the neck; in troubles of dentition, neuralgia, etc., a jaw is attached to the neck; otitis and deafness are treated by hanging an ear on the lobe of the affected side; breasts are worn by young mothers with the hope of stimulating the secretion of milk and safeguarding the mammæ from inflammation; palpitation and emotional disturbances of all kinds are treated by the application of a heart; fractures, diseases of the joints, etc., are treated by wearing the corresponding limb; and an ex-voto representing a baby boy or girl is supposed to be useful in convulsions, but is also placed on the abdomen of women in labor to hasten delivery and influence the sex of the offspring.

It is said that as a rule the clergy do not encourage the use of ex-votos, but as the practice is so strongly embedded in popular belief, dating as it does as far back as the ancient Greeks and Romans, it has been impossible to destroy the custom. The harmful feature of this practice—like other magic and psychic methods of healing—is that when the ex-voto is used, no other treatment must be employed or its healing influence will be interfered with.

A PRELIMINARY STUDY OF THE RESULTS OBTAINED IN A PRESCRIPTION SURVEY MADE IN PHARMACIES IN AND ABOUT PHILADELPHIA, 1930-1931

By Harrison R. Boggs

Philadelphia College of Pharmacy and Science

A SURVEY, in order to be complete, must have a clearly defined purpose no matter how many more interesting issues may arise during the course of examination. The purpose of this survey is to determine the status of the ingredients of certain prescriptions chosen according to therapeutic use and pharmaceutical classification. The prescriptions in question were examined as to content of ingredients, in order to determine if the ingredients were of U. S. P. X, N. F. V, nonofficial or proprietary origin. It was necessary in obtaining the prescriptions to enlist the aid of the senior students of the Philadelphia College of Pharmacy and Science. They were asked, as a regular part of assignment work in the operative pharmacy laboratory, to trace or copy the prescriptions included in the survey. As a result it was possible to obtain authentic prescriptions, accurately copied, and at the same time valuably illustrative of actual "drugstore" prescription experience. The prescriptions thus obtained were not only found to originate in Philadelphia but in an area comprising the whole of Eastern Pennsylvania.

Seven different classifications of prescriptions were examined. The classification used is as follows:

Group I consisted of "cold" prescriptions, liquid prescriptions primarily intended to combat "coughs" and "colds." These prescriptions consisting in the majority of simple solutions and mixtures, also included prescriptions of the inhalant type. "Cold" prescriptions were chosen as being the most prevalent type of general solution and mixture prescriptions.

Group II included prescriptions confined to the classification of powders, both "papers" and bulk powders.

Group III consisted of prescriptions belonging to the classification of capsules.

Group IV was entered under the classification of ointments.

Group V included liniment and lotion prescriptions.

Group VI consisted of prescriptions for pills.

Group VII—Suppository prescriptions formed the last classification.

In classifying the drugs found in the prescriptions according to the origin of the ingredient the following definition of each classification was accepted:

1. U. S. P. X drugs and preparations were classified as those which appear in the Pharmacopœia, including those drugs bearing a trade name such as Luminal, Atophan, Urotropin, etc., whose composition is generally considered as approximating that of the official drug.

2. N. F. V drugs and preparations were accepted as those which appear in the National Formulary including products bearing a trade name, but approximating the official substance, such as Ichthyol.

3. Unofficial drugs were defined as those not appearing in the U. S. P. or N. F. and not being proprietary.

4. Proprietary drugs and preparations were accepted as those drugs which were subject to the manufacturer's control or were manufacturers' specialties.

Analysis of Individual Groups of Classification

Group I, consisting of prescriptions falling under the general terminology of cold prescriptions, totaled 1026 prescriptions gathered from 132 different sources. These 1026 prescriptions contained a total of 273 drugs used 3966 times, subdivided into their correct groupings as follows:

138 drugs, used 3222 times, were of U. S. P. X origin.
36 drugs, used 204 times, were of N. F. V origin.
37 drugs, used 133 times, were found to be unofficial.
62 drugs, used 407 times, were found to be manufacturers' proprietaries.

It may be readily seen from this data that pharmacopœial drugs and preparations outnumber by far drugs or preparations of other classifications. Significance lies in the observation that pharmacopœial drugs were used 3222 times, a total far surpassing in relative comparison any other grouping of drugs.

Group II, composed of "powder" prescriptions, comprised a total of 1312 prescriptions gathered from 142 different stores. A total of 240 different drugs, used 4041 times, was found. These 240 different drugs were subdivided as follows:

162 drugs, used 3683 times, were found to be contained in the U. S. P. X.

13 drugs, used 63 times, were found to be N. F. V origin.

31 drugs, used 134 times, were unofficial.

34 drugs, used 161 times, were manufacturers' proprietaries.

As in group I, pharmacopœial drugs and preparations far outrank, both in number and rate of occurrence, the drugs of any other particular subdivision.

Group III, consisting of those prescriptions falling under the category of "capsules," totaled a number of 1460 different prescriptions gathered from 144 different stores. The total number of drugs, 266, which were used 4824 times, was classified as follows:

There were 156 drugs used 4295 times, of pharmacopœial origin.

15 drugs, used 72 times, were found in the N. F. V.

47 drugs, used 249 times, were unofficial.

48 drugs, which were used 208 times, were found to be proprietary specialties.

This group continues to show a majority of pharmacopœial drugs far surpassing those of other classifications.

Group IV, consisting of external application prescriptions classified as ointments, totaled 1301 prescriptions gathered from 149 different sources. A total of 228 drugs, used 3976 times, was subdivided as follows:

130 drugs, used 3421 times, were found to be of pharmacopœial origin.

24 drugs, used 337 times, were described in the N. F. V.

35 drugs, used 83 times, were found to be unofficial.

39 drugs, used 135 times, were found to be proprietaries.

The ointment prescriptions continue to show as in groups I, II, and III, a preference for drugs or preparations found in the U. S. P. The four groups mentioned thus far show the same general numerical relation in the classification attempted, with the exception of a slight increase in the number of N. F. V drugs and their rate of occurrence in the ointment classification (group IV).

Group V was composed of those prescriptions classified as liniments or lotions. It was composed of 279 prescriptions obtained from 84 sources; 133 drugs, used 775 times, composed the total grouping, which was subdivided as follows:

94 drugs, used 651 times, were of pharmacopœial origin.
26 drugs, used 96 times, were classified as N. F. V origin.
7 drugs, used 20 times, were found to be unofficial,
6 drugs, used 8 times, were of proprietary origin.

Although containing a much smaller number of prescriptions, this group shows the same degree of subdivision evident in the classes containing a large number of prescriptions.

Group VI, consisting of pill prescriptions, was composed of 101 prescriptions originating from 84 different stores. The total number of drugs, 78 in number and used 189 times was classified as follows:

41 drugs, used 137 times, were of pharmacopœial source.
9 drugs, used 15 times, were from the N. F. V.
22 drugs, used 30 times, were found to be unofficial.
6 drugs, used 7 times, were of manufactured origin.

The interesting fact about this grouping is the considerable, relative increases of unofficial drugs in comparison to the other groupings.

Group VII—The last grouping consisted of 197 suppository prescriptions taken from 95 different sources. The total number of drugs, 117, were used 530 times and found their way into the following subdivisions:

The U. S. P. X afforded 84 different drugs, which were used 426 times.
8 drugs, used 49 times, were found in the N. F. V.
8 drugs, used 10 times, were found to be unofficial.
17 drugs, used 45 times, were of proprietary origin.

The comparative increase in proprietaries is most distinctly noted in this last class.

Analysis of Total Number of Prescriptions Examined

The entire number of prescriptions examined was 5676, containing a total of 798 different drugs which were used 18,301 times. Of the 798 different drugs, 373 were U. S. P. This number of drugs was used 15,835 times. The total of N. F. drugs was 103, this number

being used 836 times. Unofficial drugs were present to the extent of 142, being used 659 times. 180 proprietaries were found to be used 971 times.

Repeated, or the common use, of certain drugs or preparations is evident, particularly in pharmacopœial usage.

Percentage Analysis

Expression of the percentage relation of the four classes of drugs is as follows:

Group I ("Cold" prescriptions) contains:
- 50.5% U. S. P. X drugs,
- 13.1% N. F. V drugs,
- 13.5% Unofficial drugs, and
- 22.7% Proprietary drugs.

Group II (Powder prescriptions) contains:
- 67.5% U. S. P. X drugs,
- 5.4% N. F. V drugs,
- 12.9% Unofficial drugs, and
- 14.1% Proprietary drugs.

Group III (Capsule prescriptions) contains:
- 58.7% U. S. P. X drugs,
- 5.6% N. F. V drugs,
- 17.6% Unofficial drugs, and
- 18.0% Proprietary drugs.

Group IV (Ointment prescriptions) contains:
- 57.0% U. S. P. X drugs,
- 10.5% N. F. V drugs,
- 15.3% Unofficial drugs, and
- 17.1% Proprietary drugs.

Group V (Liniment and Lotion prescriptions) contains:
- 70.6% U. S. P. X drugs,
- 19.5% N. F. V drugs,
- 5.2% Unofficial drugs, and
- 4.5% Proprietary drugs.

Group VI (Pill prescriptions) contains:
- 52.6% U. S. P. X drugs,
- 11.5% N. F. V drugs,
- 28.2% Unofficial drugs, and
- 7.6% Proprietary drugs.

Group VII (Suppository prescriptions) contains:
71.8% U. S. P. X drugs,
6.8% N. F. V drugs,
6.8% Unofficial drugs, and
14.5% Proprietary drugs.
Entire group of 5676 prescriptions contains:
46.7% U. S. P. X drugs,
12.9% N. F. V drugs,
17.7% Unofficial drugs,
22.5% Proprietary drugs.

Conclusions

1. The tendency to arbitrarily limit the drugs and preparations used in the average physician's materia medica is clearly evidenced, particularly in relation to pharmacopœial usage. The commonly used drugs were present in the prescriptions examined in large numbers. Moreover, these certain drugs were repeatedly used as is witnessed by the fact that the total number of U. S. P. drugs and preparations observed, only 373 in number were used 15,835 times. It would seem that drugs which could be used for similar purposes are seldom used, but the common drug or preparation is repeatedly used. Herein lies an opportunity for the pharmacist to educate the physician in the products which are found in the U. S. P., not only to his advantage but to the physician's as well.

2. The National Formulary gives to this survey the least number of drugs and preparations. But 12.9 per cent. of the total number of drugs found are found also in the N. F. It would seem that the number of preparations used is far below the standard one should expect from an official recipe book, particularly when one considers the fact that although the N. F. is primarily a "formula" book and fully 21.3 per cent. of the N. F. drugs and preparations prescribed are "simples" or ingredients entering into the composition of the official preparation. Here once more is an opportunity for the pharmacist to detail the physician and tell him of the value of the National Formulary for mutual benefit.

3. The unofficial drugs found in the survey contained in their number certain drugs which have been deleted from the present Pharmacopœia. It would seem, upon the evidence found, that certain of these deleted drugs such as monobromated camphor and cerium oxalate, both of which appear in large numbers, are worthy of considera-

tion for readmission. Drugs and preparations owing their activity to ephedrine and its salts seem to be of some importance.

4. Proprietary preparations are present in a large degree. The large number present indicates the efficiency of the advertising departments of the large manufacturers. One should not cite the value or unworthiness of a proprietary, but it would seem that the average pharmacist is not realizing the possibilities in the field of detailing as the manufacturer has. The pharmacist is losing the possibility of utilizing his professional knowledge by not adopting the same plan of action the manufacturer of specialties has seen fit to follow. It would seem from the evidence presented in this survey that the trend toward proprietary preparations is on the increase. Why does not the pharmacist increase the possibility of the use of official products and preparations?

THE DETECTION OF PEROXIDES IN ETHER

By L. W. Green and R. E. Schoetzow

IN AN ARTICLE on "The Quality of Commercial Ether," by Henry Leffmann and Charles C. Pines,[1] the authors state that the chromic acid test for peroxides in ether is very delicate and more convenient than the cadmium potassium iodide test directed by the U. S. P. X. Since we were interested in this subject, we conducted the following experiments:

A sample of ether containing naturally developed peroxides was tested simultaneously by both methods. The U. S. P. test gave a positive reaction immediately (light yellow color), whereas no blue color was obtained in the chromic acid test even after standing fifteen minutes, indicating the absence of peroxides by the latter test.

Both tests were then applied to ether containing peroxides and U. S. P. anesthetic ether to which hydrogen peroxide had been added. The former had stood in glass two years and had developed considerable peroxide. Hence, it was diluted with peroxide-free ether for the tests. The following table gives the details and results:

	Sample	*U. S. P. X Test*	*Chromic Acid Test*
I.	5 cc. of above peroxide containing ether diluted to 100 cc. with peroxide-free ether.	Yellow color, positive trace.	No blue, negative.
II.	5 cc. of above peroxide-containing ether diluted to 50 cc. with peroxide-free ether.	Dark yellow, heavy trace.	No blue, negative.
III.	50 cc. peroxide-free ether plus 2 drops of U. S. P. X hydrogen peroxide.	Very faint yellow.	Blue color, positive.

The chromic acid test, while not detecting the peroxide in sample I, seemed more sensitive in detecting added hydrogen peroxide. One cc. of ether was employed in the chromic acid test as recommended by the authors. As the U. S. P. X test uses 10 cc., we repeated the chromic acid tests, using this amount of samples I, II and III. The same results were obtained.

It appeared that the sensitivity of the chromic acid test might be increased both by using 10 cc. of ether and by shaking thoroughly with the reagent (1 cc.), instead of pouring the reagent through the ether with little, if any, agitation as Leffmann and Pines recommend. Ac-

cordingly, tests were repeated on ether containing naturally developed peroxides and the following observations were made at the indicated intervals:

Time	*U. S. P. Test*	*Chromic Acid Test*	*Chromic Acid Test, Using 10 cc. Ether and Shaking at Intervals*
2:30 (start)	Very faint yellow	Negative	Negative
2:40	Light yellow	"	Brownish-green
2:50	" "	"	Light blue
3:00	" "	"	" "
3:20	" "	Slight greenish-blue	" "
3:30	" "	Light blue	" "

These results show again that the chromic acid test by either method is less sensitive than the U. S. P. test in the detection of naturally developed peroxides in ether.

The fact that it was very sensitive to hydrogen peroxide suggested interference by aldehydes, which often occur with peroxides (Clover states [2] that aldehydes are the product of the spontaneous decomposition of peroxides). In further investigation, a sample of ether was divided into three 50 cc. portions. Two drops of U. S. P. hydrogen peroxide were dissolved in one, and two drops each of U. S. P. hydrogen peroxide and acetaldehyde in another, the third being retained as a control. All three were then tested for peroxides by both methods. All three gave negative results (absence of blue color) with the chromic acid test. The U. S. P. test showed peroxide in the first two and none in the control. In this experiment, the U. S. P. test again proved more sensitive than the chromic acid test and was not influenced by the small amount of aldehyde. We repeated the experiment increasing the hydrogen peroxide and the acetaldehyde to six drops, with the following results:

Sample	*U. S. P. Test*	*Chromic Acid Test*
I. 50 cc. of U. S. P. X ether, plus 6 drops of hydrogen peroxide	Faint yellow	Blue
II. 50 cc. Sample I, plus 6 drops of acetaldehyde	Faint yellow	Faint blue
III. U. S. P. X ether	No color	No color

The addition of acetaldehyde definitely reduced the blue color produced in the chromic acid test, whereas it did not reduce the intensity of the yellow color obtained in the U. S. P. test. On increasing the amount of acetaldehyde to twenty drops without changing the

peroxide concentration, only the faintest suggestion of blue color was obtained with the chromic acid test, whereas the yellow coloration of the U. S. P. test was not diminished. Aldehydes, then, interfere with the peroxide-chromic acid reaction.

We then applied the Leffmann and Pines test to two samples of ether which contained a faint trace of peroxide by the U. S. P. X test. One of these was aldehyde-free by the U. S. P. test. The other contained less than five parts per million of aldehyde (decidedly less than detectable by the U. S. P. test). The Leffmann and Pines test yielded negative results with both these ethers, while the U. S. P. X test disclosed the presence of traces of peroxides.

In the U. S. P. test, the yellow coloration, or free iodine, visible in the aqueous layer, tends to leave the aqueous layer and to be dissipated in the ether on further shaking. The result is that faint yellow colors appear to fade, and if the examination is made only at the end of the prescribed hour, may be missed entirely. It appears desirable to avoid vigorous shaking, to observe from time to time (peroxides are evident within fifteen minutes, if at all), and to examine the cylinder contents vertically as well as horizontally.

Conclusions

I. The chromic acid test, as recommended by Leffmann and Pines, is not as sensitive as the U. S. P. X test in the detection of peroxides which have developed in ether.

II. The presence of aldehyde (commonly present in peroxidized ether) decreases the sensitivity of the chromic acid test. However, it is not as sensitive as the U. S. P. X test when applied to aldehyde-free ether containing peroxides.

III. The chromic acid test was modified as to increase its sensitivity, but not sufficiently to equal the U. S. P. test.

REFERENCES

(1) *American Journal of Pharmacy* (1930), 102, 58.
(2) *Journal of the American Chemical Society* (1922), p. 1107.

Analytical Laboratories,
Chemical and Pharmaceutical Division.
E. R. Squibb & Sons.

OPEN DISPLAY—FOR PHARMACIES AND PHARMACISTS

By John E. Kramer

Acting Registrar, Philadelphia College of Pharmacy and Science

TEN-CENT tables, open display, merchandising appeal, display space, window trims; all these to sell merchandise to the drug store customer. At least, so the story goes in this latest upheaval of the pharmaceutical trade world.

The merchandising appeal of good display material is an admitted fact, with proof beyond all doubt. Articles of trade are sold this way, and ideas are sold in much the same manner. Display—open display. Why not sell professional pharmacy, too, by display? It's a great thing in itself, professional pharmacy, with its own sales points and its own peculiar appeal to the public. The pharmacist's ability, his service, his skill, anything to impress the customer with the fact that the pharmacist is a professional man, can make use of salesmanship.

Most drug stores have their prescription departments in a little room to the rear. Some are dark, some are dingy. Most have a "KEEP OUT" or a "PRIVATE" sign on the door and the great majority are removed from the eyes of man.

But gone are the days when the art of the apothecary was the great mystery, the great hocus-pocus, the abacadabra of the Middle Ages. Medicine and other sciences have advanced in great strides, and the man on the street, the mystified one in the days when potions were brewed to the accompaniment of fantastic incantations, is now the intelligent observer, really but a few steps behind the professional man and the scientist. Facts of medicine, pharmacy, dentistry, physics and other sciences are in daily print in the newspapers and magazines. Surely the editors would not print them if they were not certain that the "average man" could understand the text. Popular science has a strong grip upon the people, who are anxious to see, to learn, and to be impressed by facts and folks who can perform the feats of the various professions.

We hear some people today bewailing the fact that the pharmacist is losing his professional standing in the community, that he has turned merchant, price-cutter, soda dispenser, and what not. And why shouldn't the public think so? Pharmacy has changed in appearance. It has added many things to its list of stock on hand. Soda fountain,

cosmetics, perfumes and numerous other articles, all clamoring for public attention, and all helping turn in to the druggist the financial means to support his professional endeavors. Truly the druggist is more of a merchant, but remember that he is also more than a merchant.

Keep in mind that with all these bizarre additions, the prescription department has been kept in the back room, away from the public view. No matter how busy the prescription department may be, no one in the front of the store is conscious of the fact except the individuals who may be awaiting the completion of a prescription. Hustle and bustle is not a part of the routine "back there," and any possible fever of activity is rendered noncontagious by the very solid partitions.

No drug store should be ashamed of its prescription department. Rather, it should be the show place of the establishment. There is no need to go into the details of the appearance of such a department. Cleanliness, orderliness, dignity of atmosphere and personal neatness all go without mention.

The model drug store in the Philadelphia College of Pharmacy and Science, a completely equipped store wherein the students are taught some of the elements of pharmacy through demonstration and actual practice, has its prescription department directly to the right of the customer as he enters. The equipment is all white and the partitions are of glass, so that the customer may see every bit of activity in this sanctum sanctorum. It has been my pleasure to escort many visitors through this store. Most of these men are retail pharmacists. All expressed approval of this "open display" feature. Many expressed the wish that they could install such an arrangement in their own stores, and there were some who left with the avowed purpose of making the change immediately. Drug store furniture companies are very happy to co-operate with pharmacists in the installation of such partitions and equipment.

To the person awaiting the compounding of a prescription the actual sight of the work being done acts as a mental stimulant. The manipulations necessary in the filling of any prescription are such as to instill confidence in the mind of the onlooker. Think of the impression that can be made by a white-jacketed pharmacist working in an array of pharmaceutical utensils. Which would be the more attractive to watch while in a drug store—a clerk wrapping a package, a fountain man drawing a soda, or a pharmacist compounding a prescription? Eye appeal is what counts.

Many drug stores have already taken advantage of these facts and have installed departments visible to the public. Some have even gone so far as to place their compounding counters in street display windows. More power to them. Apply open display methods to pharmacy, pharmacists and pharmaceuticals, and watch the profession commence to rise once more to its rightful place.

DETERMINATION OF PHENOLPHTHALEIN IN THE PRESENCE OF CAFFEINE AND CINCHONA ALKALOIDS AND ANTHROQUINONE BEARING DRUGS AS APPLIED TO MEDICINAL TONICS*

PLACE 25 cc. distilled water in a separatory funnel, add 1 cc. of sample of tonic being analyzed, then 1 cc. of concentrated HCl. Extract 3 times with ether 50 cc. each time. Wash ether extracts with 25 cc. water. Draw off H_2O and discard. Evaporate ether in a 400 cc. beaker cold under air from electric fan.

Take up residue in beaker with 5 cc. alcohol 95 per cent. and transfer to 100 cc. cylinder (do not use over 5 cc. alcohol). Wash beaker with approximately 25 cc. H_2O and place in cylinder, then rinse beaker with 5 cc. 10 per cent. NH_4OH solution and add to contents of cylinder. Make whole up to 100 cc. with water and thoroughly mix.

A standard containing ¼ grain of phenolphthalein per fluid ounce should be made up and treated in same manner, using 1 cc. of standard made to 100 cc. for comparison. The advantage of using this quantity of phenolphthalein will soon be obvious to the analyst as it furnishes 1/120 of a grain to be used for producing the necessary shade of color in the colorimetric tubes. It allows a variance of color from light pink to medium and a darker shade when read in the colorimeter, as too dark a shade cannot be accurately read.

We now have 2 cylinders made up to 100 cc. containing 1/120 of a grain of phenolphthalein in our standard and an unknown quantity in the sample being analyzed.

If the sample being analyzed shows an appreciably darker color than the standard, take 50 cc. and dilute again to 100, or it may be necessary to take 25 cc. and dilute to 100 to get a fairly matched sample to read in colorimetric tubes with the standard. If the sample under analysis has less than ¼ grain per fluid ounce, it will then be necessary to dilute the standard to get a similar color for the two solutions.

Next, place part of each solution in Schreiner colorimetric tubes graduated in millimeters and read depth of color in a colorimeter. In this way the color can be accurately matched. From the ratio of the

*Contribution from Bureau of Industrial Alcohol, Washington, D. C.

depth of color and the different dilutions the quantity of phenolphthalein used in the sample is easily calculated.

We have found that emodin bearing drugs up to 15 grains per fluid ounce in these preparations do not affect an accurate phenolphthalein analysis.

This method has proven exceedingly accurate and satisfactory with the tonics which we have so far received.

MEDICAL AND PHARMACEUTICAL NOTES

DETERMINATION OF pH BY USE OF THE LOVIBOND TINTOMETER *—The authors prepared a number of buffered solutions according to standard methods, ranging from 2.0 to 10.0, with intervals of 0.2. These solutions were checked by the electrometric method using a saturated calomel electrode and quinhydrone electrode for determinations up to pH 8.0 and a saturated calomel and hydrogen electrode for pH values fom 8.0 to 10.0.

In making the comparison determinations the solutions were tinted according to the LaMotte method, using 10 cc. of the solution and 0.5 cc. of indicator suitable to the range observed.

The colored solution was then placed in a half-inch Lovibond cell and matched with colored slides. The numbers on the slides were then recorded in correspondence to the pH determined electrometrically.

After the calibration of the Lovibond instrument covering the range of experimental work planned, the pH values of unknown solutions were then assayed by the different methods and experiments were made with colored solutions and with turbid solutions.

The observations were tabulated in series and the results studied from graphs which were plotted for each indicator.

The conclusions resulting from the work were as follows: The Lovibond tintometer has been calibrated for use as a pH comparator for solutions whose pH value is desired. It is found to have several advantages over the method of using standard colored solutions in the following respects:

1. Accuracy; the possibility of error by the deterioration of colors as in the case of standard colored solutions is eliminated as the colors of the glass slides are permanent.

2. Sensitivity; the smallest variation that can be read directly by the use of the colored standard solutions is 0.2 in pH, while by the use of the Lovibond tintometer a variation of 0.05 in pH can be noted.

3. Colored solutions; the pH of colored solutions can be readily determined by the use of known compensating colors.

*Conclusions reported in a thesis presented by A. Franklin Deuble and Jacob Gelb, candidates for the degree of B. Sc. in Chemistry, June, 1931.

4. Turbid solutions; turbidity does not affect the use of the Lovibond apparatus for pH determinations so long as the passage of light through the sample is sufficient for obtaining the necessary comparison with the colored glasses.—(Abstracted by *Charles H. LaWall.*)

PHYTOCHEMISTRY OF PODOPHYLLUM PELTATUM L.*—This thesis covered the following ground:

1. General and historical data.
2. Experimental data:
   - A. Collection and drying of separate parts of the plant (rhizomes, roots, leaves, stems and fruit) by four methods of drying: (1) Air circulation at room temperature; (2) blotting paper; (3) constant temperature drying oven at 50° C.; (4) constant temperature drying oven at 100° C.
   - B. Identification and localization by microchemical tests of:
     1. Resin.
     2. Tannin.
     3. Pigment.
     4. Sugar.
     5. Starch.
   - C. Extraction of resin from rhizomes and from roots.
   - D. Bibliography.

The plant material was collected during July, August and September, 1930, in the vicinity of Buffalo, New York.

The method of drying, using a constant temperature drying oven at 50° C., was considered to give the most satisfactory results.

The application of microchemical tests localized the starch in the two lower layers of the epidermis. The sugar was found to be localized in the cortex and pith. The resin was found to exist in the fibrovascular bundles. The pigment (quercetin) was found in the cortex and pith. The tannin was localized in the cells of the fibrovascular bundles.

*Abstract of a thesis presented to the Faculty of the Philadelphia College of Pharmacy and Science by Elsie M. Klenke, in partial fulfilment of the requirements for the degree of Bachelor of Science in Pharmacognosy in June, 1931.

The resin was determined by extracting the drug at 20° C. with a mixture of equal volumes of acetone and alcohol. This percolate was evaporated to a syrupy consistency allowed to cool and diluted with the acetone-alcohol mixture which produced a precipitation consisting mainly of tannin. A portion of this solution was then filtered, placed in a separatory funnel, mixed with an equal volume of water acidulated with 0.6 per cent. hydrochloric acid and shaken out with three successive portions of a mixture of one volume of alcohol-acetone solution and two volumes of carbon tetrachloride. The combined carbon tetrachloride extractures were washed with acidulated water and finally evaporated and the residue dried at 100° C.

The foregoing assay method was compared with a number of other proposed methods with results as follows:

1. The method of the U. S. P. IX yielded 5 to 6 per cent. of resin.

2. The method of the U. S. P. X yielded 6 to 7 per cent. of resin.

3. The method of Jenkins (*J. Ind. & Eng. Chem.*, 1914) yielded 5 to 6 per cent. of resin.

4. A method of cold percolation with acetone-alcohol mixture followed by precipitation, as in the U. S. P. IX, yielded 5 to 6 per cent. of resin.

5. The method described above yielded 4 to 5 per cent. of resin.

It is believed that the method described in this thesis, by eliminating tannin and other foreign constituents by the preliminary fractional precipitation previous to the final shaking out, yields a purer resin than do any of the other methods proposed.—(Abstracted by *Charles H. LaWall.*)

INCOMPATIBILITY OF MORPHINE AND CODEINE WITH ACETYLSALICYLIC ACID—Jordan and Klemm describe in *Therapeutische Berichte* (1930, No. 9), a case, where after the administration of a mixture of morphine and aspirin symptoms of poisoning were observed. In a second case (O. Heller, *ibid.*, 1931, No. 2), where a codeine derivative with acetylsalicylic acid had been prescribed in the form of powders, severe symptoms of alkaloidal poisoning set in. Chemical analysis showed that the powders were correctly compounded. Possibly formation of diamorphine had taken place, which

was badly borne by the patient, but this could not be established beyond doubt. It is suggested that it would be well to avoid combinations of morphine and its derivatives with aspirin.—(*Phar. Jour.*)

NEW AND NONOFFICIAL REMEDIES—SKIODAN—Methiodal—$Ch_2.I.SO_3Na$—The sodium salt of mono-iodo-methanesulphonic acid. Skiodan contains 52 per cent. of iodine.

Actions and Uses—Skiodan is proposed as a therapeutically indifferent medium for roentgenography, especially for visualization of the urinary tract either by intravenous injection or by direct injection into the renal pelvis through a ureteral catheter. It has also been administered rectally. It has been reported that skiodan exerts a diuretic action, most marked during the first half hour after intravenous injection. Excretion studies show that within a few minutes after intravenous injection the concentration of skiodan in the urine reaches a maximum of from 4 to 6 per cent. (corresponding to from 2 to 3 per cent. of iodine). Usually, 75 per cent. is eliminated in three hours, more than 90 per cent. in ten hours, and the remainder within about twenty-four hours.

Dosage—For intravenous urography, skiodan is administered in sterile aqueous solution (from 20 to 40 Gm. in 100 cc.), the average dose for adults being about 2 Gm. for each 15 pounds of body weight; for retrograde pyelography an aqueous solution of skiodan (from 10 to 20 Gm. in 100 cc.) is injected through a ureteral catheter into the renal pelvis. Aqueous solutions of skiodan should be kept protected from light; they can be kept for a considerable time without impairment but should be resterilized before use.

On the day before the intravenous injection of skiodan the patient is given a soft diet, with a cleansing enema in the evening. During the night the fluid intake is restricted as much as possible.

Manufactured by The Bayer Company, Inc., Rensselaer, N. Y. (Winthrop Chemical Co., New York, distributor). U. S. patent applied for. U. S. trade-mark.

Skiodan occurs as a white, crystalline, odorless powder possessing a slight saline taste followed by a sweetish aftertaste; it is very soluble in methyl alcohol, slightly soluble in ethyl alcohol, practically insoluble in acetone, benzene and ether; the aqueous solution is neutral to litmus; on exposure to light it decomposes, turning to a yellow color.—(*Jour. A. M. A.*)

THE U. S. P. X ERGOT TEXT—When the U. S. P. X text for ergot and fluid extract of ergot were developed almost ten years ago they represented the judgment of those best qualified in this country to establish ergot standards and conformed to the then known scientific knowledge of that drug.

Since the last revision, however, extensive studies have been made, both here and abroad, involving the alkaloids of the drug and their isolation, the determination of the potency of the drug and its preparations, by various new assay methods, or modifications of the official method, and also the avoidance of deterioration, especially in the fluid extract.

As these studies seem to have progressed to a point which promises definite improvement in the assay and preservation of the products recognized by the U. S. P. and in consideration of the therapeutic importance of this drug, the committee of revision is taking the necessary steps to determine the proper course to follow at this time. If it is found that convincing evidence is now at hand to materially improve the existing standard and the method of assay, the committee has the authority, granted by the convention, to issue supplements between revisions, and under this authority, could, by vote, establish a modified assay method and standard, and announce these as the official text to go into force within a reasonable adjustment period.

That the revision committee may be in a position to determine a proper course of action, a conference of the subcommittee on bio-assays was held last June with the officials of the Food and Drug Administration and other bio-assay experts, many of whom are associated with pharmaceutical manufacturers. Since then the revision committee has arranged with Dr. E. E. Nelson, an associate at the University of Michigan of Dr. Edmunds, the chairman of the U. S. P. bio-assay sub-committee, to make for the committee a specific study of every side of this question. Among other phases of this study Dr. Nelson has personally visited the laboratories of a number who are now assaying ergot, governmental, private, and manufacturers', and observed their exact technique and end reactions, and in this way brings to the committee a comprehensive knowledge of the situation. The chairman of the committee of revision, E. Fullerton Cook, with Dr. Edmunds and Dr. Nelson, also accepted an invitation to meet with the officials of the Food and Drug Administration and the Ergot Division of the "contact committee" of manufacturers in Washington

on September 14th to further consider the question in the light of recent studies and with the hope of a satisfactory solution.

There has never been any doubt as to the position of the committee of revision in this and every other question affecting the official standards. The first duty of the committee is the establishment of standard and assays, if these can be provided, whereby the patient and the doctor are supplied with uniformly potent therapeutic agents. Questions so complex as ergot, involving the methods of assay and the maintenance of activity in its preparations, make difficult the attainment of this ideal, but the splendid researches in this field during the past five years give promise of success even with so difficult a drug.

NEWS ITEMS

A New Honor for Professor LaWall—Professor Charles H. LaWall, Dean of the Philadelphia College of Pharmacy and Science and Secretary of the Committee of Revision of the United States Pharmacopœia, has just been notified by the Medical Director of the Health Committee of the League of Nations of his appointment to represent the United States of America, on the International Committee for Assaying Opium.

The chairman of this committee is Dr. L. Van Itallie, professor of pharmacy and toxicology at the University of Leyden.

Other members of the committee are pharmaceutical chemists from Denmark, Switzerland, France, Austria, Germany, Japan and Great Britain, one member from each country.

The purpose of the committee is to make a systematic study of the more important methods of opium assay, with a view to the approval of some one method for official adoption by the various pharmacopœias of the world.

The appointment of this committee was made at the request of the Advisory Committee on Traffic in Opium and Other Dangerous Drugs, which has been in session at Geneva since May of this year.

Yeast Research at Mellon Institute—Dr. Edward R. Weidlein, Director, Mellon Institute of Industrial Research, Pittsburgh, Pa., has announced that the institution has accepted from the National Grain Yeast Corporation, Belleville, N. J., a grant for a comprehensive investigation of the chemistry and technology of yeast. This research, which will be operated as an Industrial Fellowship of the Institute, will be conducted with the close collaboration of specialists in the donor's organization; and the results will be made available as the various stages of the studies are completed.

According to the announcement, this investigation will be especially beneficial to food products manufacturers who are important users of yeast; the facilities of the Institute will be applied through the Fellowship to various problems in the production and utilization of yeast, looking toward the improvement of present-day practices and products.

Roy Irvin, a food and nutritional chemist, has been appointed to the incumbency of the Fellowship. He has been a Fellow of Mellon Institute since 1917, following the completion of his professional graduate work at the University of Kansas, and has contributed valuably to the literature of bread and baking technology, cereal products, and eating habits.

PHILADELPHIA COLLEGE AWARDS GRADUATE FELLOWSHIPS—Five fellowships for graduate research in pharmacy and related sciences have just been awarded at the Philadelphia College of Pharmacy and Sciences.

The Henry Leffmann fellowship for pharmaceutical chemistry research was awarded to Dr. Maria A. Mesa de Ponce of Havana, Cuba, who will study the stabilization and standardization of ergot. Dr. de Ponce holds the degree of Bachelor of Science from the Institute of Havana, and that of Doctor of Pharmacy from the University of Havana. For a number of years she has been assistant professor of science in the normal school in Havana. She was secretary of the Cuban commission which made the Spanish translation of the tenth revision of the U. S. Pharmacopœia and has been active in pharmaceutical circles in Cuba.

Her research work will be under the direction of Professor E. Fullerton Cook, chairman of the U. S. P. XI revision committee. She also is taking graduate courses leading to an advanced degree at the Philadelphia College.

The fellowship for the study of the chemical and medicinal properties of capsicum has been awarded this year to Linwood F. Tice who graduated from the Philadelphia College in 1929. For the past year Tice was professor of pharmacy at Baylor University, Dallas, Texas.

The continuation of the pioneer studies undertaken at the Philadelphia College in the enteric coating of tablets and capsules has been provided for by a graduate fellowship which this year is held by Allen F. Peters, who received the degree of Bachelor of Science from the Philadelphia College in 1931. This fellowship is made possible through the co-operation of Eli Lilly and Company.

Another grant from the Henry Leffmann fellowship for research in pharmaceutical chemistry has been awarded to Ruth E. Miller, who

will continue her studies on the antiseptic properties of the volatile oils, which was the subject of her thesis submitted for the master's degree in 1930. Last year Miss Miller conducted the research work in the antiseptic properties of iodine under the scholarship sponsored by the Mellon Institute.

Miss Elsie M. Klenke, a candidate for the degree of M. Sc. in bacteriology, will continue her studies of podophyllum under a fellowship award from the Wm. H. Gano fund.

BOOK REVIEWS

WILD FLOWERS OF THE ALLEGHENIES. By Joseph E. Harned. Published by the Author, Oakland, Md. Price, $4.50.

Here is a new and interesting book for the botanist, especially for the taxonomist and the lover of wild flowers in general.

The author is a retail pharmacist who received his fundamental knowledge and his inspiration while a student under Professor John M. Maisch at the Philadelphia College of Pharmacy many years ago.

Settling down to practice his profession in the heart of the Allegheny Mountains, Mr. Harned has devoted his life to a study of the flora of this region.

Like Chapman's "Southern Flora," and Coulter's "Rocky Mountain Flora," the range is somewhat limited, at least by the title of the book, but when one glances through it, one meets representative plants which are common along the entire Atlantic Seaboard.

There is a most interesting introduction by the author, who has made classification and identification easy for the beginner in botany by an illuminating and splendidly illustrated section on leaf forms, floral plants and floral characters.

The analytical key to the families is a valuable contribution supplied by Professor K. M. Wiegand, of the Department of Botany of Cornell University.

The illustrations, numbering more than four hundred line drawings and eight colored plates, were made especially for this work by Mr. F. Schuyler Mathews, the well-known botanist and artist.

The volume is one which will find a welcome place in the library of every lover of flowers, while as a text and reference work no general library or college library will be complete without it.

CHARLES H. LA WALL.